

Intel Express 10/100
Fast Ethernet Switch
User Guide

First edition December 1996

Copyright © 1996, Intel Corporation. All rights reserved.
Intel Corporation, 5200 NE Elam Young Parkway, Hillsboro, OR 97124-6497

Intel Corporation assumes no responsibility for errors or omissions in this manual. Nor does Intel make any commitment to update the information contained herein.

* Other product and corporate names may be trademarks of other companies and are used only for explanation and to the owners' benefit, without intent to infringe.

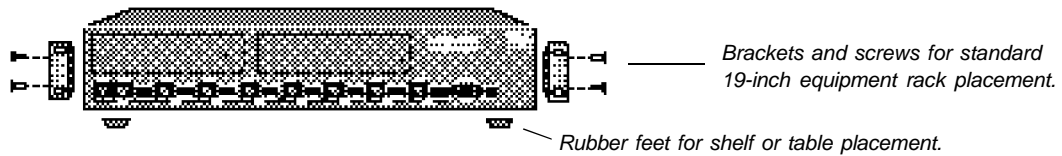
Contents

Quick Start	1
Chapter 1 Hardware Installation and Network Topology	3
Overview	3
Installation and Setup	4
Using the Switch	5
Port status LEDs	5
Management status LEDs	6
Cabling Requirements	7
UTP requirements	7
Fiber optic requirements	7
Straight-through vs. crossover cables	8
Typical Configurations	10
Configuring the mixed 10 and 100 Mbps workgroup environment	10
Configuring the Wide Area Network (WAN) or multi-floor environment	12
Repeater count limitations	14
Chapter 2 Configuring and Managing the Switch	15
Accessing the Console Manager	16
Using the Console Manager	17
Entering commands	17
Console Manager command groups	19
Sample Console Manager Session	20
Configuring the SNMP agent for IP	21
Configuring a port for full duplex	22
Creating Virtual LANs (VLANs)	23
Monitoring traffic	25
Chapter 3 Console Command Reference	31
Console Command-line Summary	32
Console Commands	38
System Commands	39
IP Commands	43
IP configuration	43
Ping Commands	46
Address Resolution Protocol (ARP) Commands	47

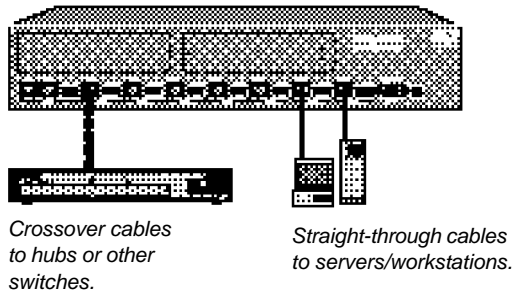
SNMP Commands	48
SNMP community strings	48
SNMP trap message commands	49
Switching Database Commands	50
Database control commands	51
Custom filtering	54
VLAN Commands	56
Spanning Tree Commands	60
Port Configuration Commands	65
Statistics Commands	66
Chapter 4 Troubleshooting	71
General Problems	72
Flow Control Problems	73
Appendix A Technical Information	75
Default Configuration	75
Specifications	77
SNMP and MIB Support	80
Limited Hardware Warranty	81
Index	85
Intel Automated Customer Support	Inside back cover

Quick Start

1. Install the Express 10/100 Switch in a rack or on a shelf or table and plug the cord in. If you're in Europe or Asia, or any other country that has a 220-volt electrical system, set the power supply switch to 230 (115 is the default). Otherwise, leave the switch set to 115. Turn the power on.

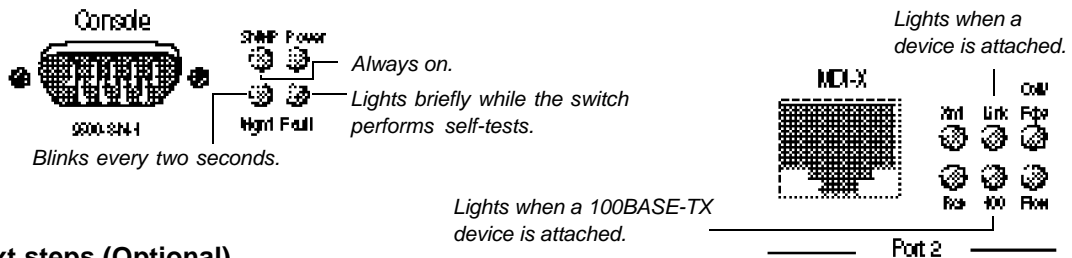


2. Connect the network devices to the switch.



Cabling Guidelines		
	at 10 Mbps	at 100 Mbps
Server/ Workstation to Switch	CAT 3, 4, or 5 straight-through	CAT 5 straight-through
Hub to Switch	CAT 3, 4, or 5 crossover	CAT 5 crossover
Switch to Switch	CAT 3, 4, or 5 crossover	CAT 5 crossover

3. Check the LEDs for power and links.

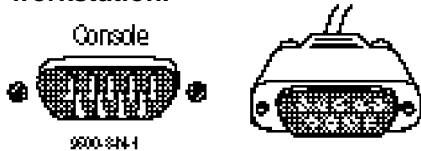


Next steps (Optional)

- Continue to the next page if you want to configure the switch to work with an SNMP-compliant Network Management System (NMS).
- See Chapter 2 if you want to use the Console Manager to change port configurations (set a port for full duplex or manually set the speed), assign an IP address, or check port statistics.

(Optional) Quick Start for SNMP Management

4. Use the null-modem cable to connect the Console port to a COM port on a workstation.



A null-modem cable is provided with the switch.

5. Open a terminal emulation program (such as HyperTerminal in Microsoft Windows* 95). Use these communication parameters:

- 9600 baud
- 8 data bits
- No parity
- 1 stop bit
- Xon/Xoff flow control

6. Press *E* and log into the Console Manager:

Login:
password:

By default, no password or user name is assigned. If you enter one, it's saved upon reset.

7. Set the IP configuration using the `set-ip-conf` command:

```
set-ip-conf 192.1.1.64 255.255.255.0 192.1.1.255 E
            |           |           |
            IP address  netmask     broadcast address
```

Replace these addresses with the numbers for your network. Specify the IP address, netmask (subnet mask), and broadcast address (default gateway), in that order.

8. Download the Intel MIB (Management Information Base) file from an Intel online service and compile it into your NMS.

The MIB filename is SWCH2MIB.EXE. You can find the file on Intel's Customer Support web site (<http://support.intel.com>) or the Intel BBS (*Host:* ftp.intel.com, *Directory:* pub/support/enduser_reseller). See your NMS documentation for instructions on compiling the MIB for a new device.

1

Hardware Installation and Network Topology

Overview

The Intel Express 10/100 Fast Ethernet Switch features eight auto-negotiating 10BASE-T/100BASE-TX ports. Each port supports an Ethernet (10 Mbps) or Fast Ethernet (100 Mbps) segment. The switch also has two slots for optional two-port media adapters (such as 100BASE-TX or 100BASE-FX).

The switch also has a built-in SNMP (Simple Network Management Protocol) agent and can be monitored and controlled through any SNMP-compliant Network Management System (NMS), such as Intel LANDesk® Network Manager. See page 21 for information on using the switch with an SNMP NMS and getting the switch's MIB.

Installation and Setup

1 Install the switch in a rack or on a shelf.

For rack placement, connect the switch to a 19-inch rack using the enclosed rack mount brackets.

For shelf placement, attach the enclosed rubber feet to each corner of the bottom of the switch and place it on a flat, level surface.



WARNING

If you're in a country that has a 220-volt electrical system, you must set the power switch to 230.

Most European and Asian countries have 220-volt systems.

The power cord is a North American type, UL-listed/CSA-certified power supply cord. Immediately discard this cord if it is inappropriate for the electrical system of your country, and obtain the proper cord as required by your national electrical codes or ordinances and certified for use in your region.

2 Plug the switch in and turn the power on.

Plug the switch into an active AC outlet and turn the power on. If you're in Europe or Asia, or any other country that has a 220-volt electrical system, set the power supply switch to 230 (115 is the default). Otherwise, leave the switch set to 115.

The United States and Japan both have 110 volt systems.

3 Connect the 10BASE-T or 100BASE-TX devices.

Follow these general guidelines:

- You don't need to manually set the speed. The switch automatically detects the speed of the connected devices.
- Always use Category 5 unshielded twisted-pair (CAT 5 UTP) cable when connecting 100BASE-TX devices. You can use CAT 3, 4, or 5 UTP for 10BASE-T devices.
- Limit the distance between devices connected with UTP cable to 100 meters.
- Use a crossover cable when directly connecting a hub (also called a repeater or concentrator) to the switch. Use straight-through cables when connecting to servers or workstations. If you don't have a crossover cable, use the MDI connector on port 1 to connect a hub.
- Configure the network so devices that talk primarily to each other are on the same segment. Each port is a single segment.

4 Is setup complete?

If you're using the switch as a stand-alone device (not under the control of network management software), you're done.

If you want to change the default configuration (shown in Appendix A) or manage the switch, continue to Chapter 2.

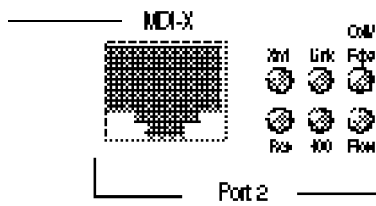
Using the Switch

The switch requires minimal user intervention. It automatically learns the addresses of new devices as you connect them, and will relearn addresses dynamically if you reconfigure the network. It also automatically detects the speed of connected devices. You don't need to manually set the speed.

Port status LEDs

Port LEDs provide information about each port's configuration and the status of devices connected to the ports.

Ports on the switch are wired MDI-X for connection to MDI ports using a straight-through UTP cable. See page 8 for more information.



Xmt **Transmit.** Lights when the switch is transmitting packets from this port to another port. Normally blinks at regular intervals, even if no devices are connected, while it updates the internal SNMP agent.

Rcv **Receive.** Lights when packets are received on this port, even if they are not forwarded.

Coll/Fdpx **Collision (default) or Full Duplex.** Blinks when collisions are detected. Collisions are normal in an Ethernet environment. However, if the collision LED is on continuously, you may have a problem with a device on the segment.

If you've enabled full duplex on the port, the LED is on solid. When full duplex is enabled, collisions aren't possible because packets are sent and received on their own wire pair, so they can't collide.

NOTE

The default configuration of all ports is half-duplex mode.

To change to full duplex, use the Console Manager. See page 22 for instructions.

- Flow** **Flow control.** Lights whenever too much traffic is entering on a port. When this happens, the switch's buffers fill and it's forced to back pressure the traffic out to the segment for retransmission. This allows the switch's buffers to clear before the segment retransmits the traffic. See page 73 for a description of flow control.
- 100** **Speed.** Lights when a 100BASE-TX device is connected to the port. The LED is off when a 10BASE-T device is connected.
- Link** **Link.** When solid, indicates a connection is established. If the Link LED is off, check for loose cable connections. Also, make sure you're using the correct type of cable, either straight-through or crossover. See page 8 for more information.

Management status LEDs

Management status LEDs provide information about the overall operation of the switch and its SNMP management components.



Use these communications settings when accessing the built-in Console Manager application. See page 16 for more information.

- SNMP** **Simple Network Management Protocol.** Always on, indicating the built-in SNMP agent is working.
- Mgmt** **Management.** Blinks on at regular intervals as the SNMP agent is polled for updated information.
- Power** **Power.** Indicates the status of the power supply. The LED is normally on. It may remain off for a few seconds during the power-on self-test.
- Fault** **Fault.** Indicates that the switch has detected a problem. It may remain on for a few seconds during the power-on self-test. If this indicator blinks or remains lit after self-test, there's a problem with the switch.
See Chapter 4 for troubleshooting information.

Cabling Requirements

Incorrect cabling is often the cause of network configuration problems. It's important that you understand cabling requirements before connecting devices to the switch.

UTP requirements

The 100BASE-TX Fast Ethernet specification requires you use Category 5 unshielded twisted-pair (CAT 5 UTP) cabling to operate at 100 Mbps per second. If you use lower grade cabling (CAT 3 or CAT 4), you may get a connection, but will soon experience data loss or slow performance.

The 10BASE-T Ethernet specification allows you to use CAT 3, CAT 4, or CAT 5 UTP cabling.

You're limited to 100 meters between any two devices with UTP cable whether you're running at 10 Mbps or 100 Mbps. However, you can extend the total diameter by installing a fiber optic media adapter and using fiber optic connections between switches, or between the switch and a hub (repeater), router or bridge. See page 12 for an example.

Fiber optic requirements

The optional 100BASE-FX fiber optic media adapter (Intel product code ES101MAFX) lets you use multimode fiber optic cable to connect two switches, or to connect the switch to a hub, bridge, or router. The media adapter uses an SC fiber optic connector.

With multimode fiber optic cable, signals can travel up to 412 meters between two switches or between the switch and a router when the link is configured at half duplex. If configured at full duplex, the signal can travel up to 2 kilometers.

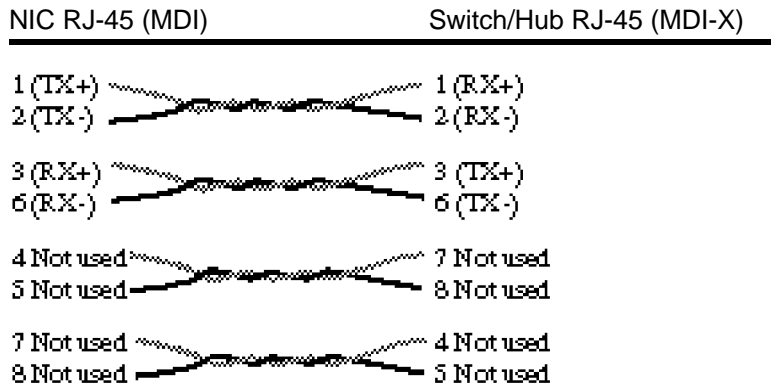
The signal can travel up to 160 meters between the switch and a hub (repeater). Full duplex isn't possible between the switch and a hub.

Straight-through vs. crossover cables

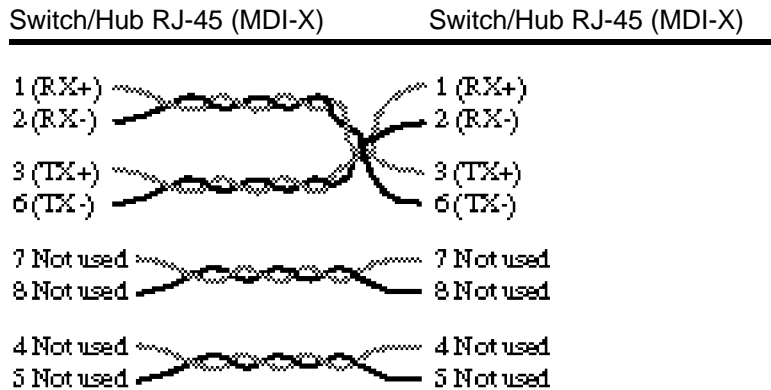
Ports on the switch are wired MDI-X so you can use a straight-through cable when connecting to a workstation or server (adapter cards are wired MDI). For direct connection to another MDI-X port (most hubs and some switches), you must use a crossover cable.

NOTE

When making your own cables, wires 1 and 2 must be a twisted pair and 3 and 6 must be a twisted pair.



A straight-through (standard) cable connects MDI ports to MDI-X ports.



A crossover cable connects MDI-X ports to MDI-X ports (or MDI ports to MDI ports).

Determining which cable to use

Different switch and repeater manufacturers implement their port configurations differently. The following guidelines are based on the Express 10/100 Switch, the Intel Express 100BASE-TX Stackable Hub (repeater) and the EtherExpress™ family of adapters (server or workstation). These apply to the majority of switches and hubs and all servers or workstations:

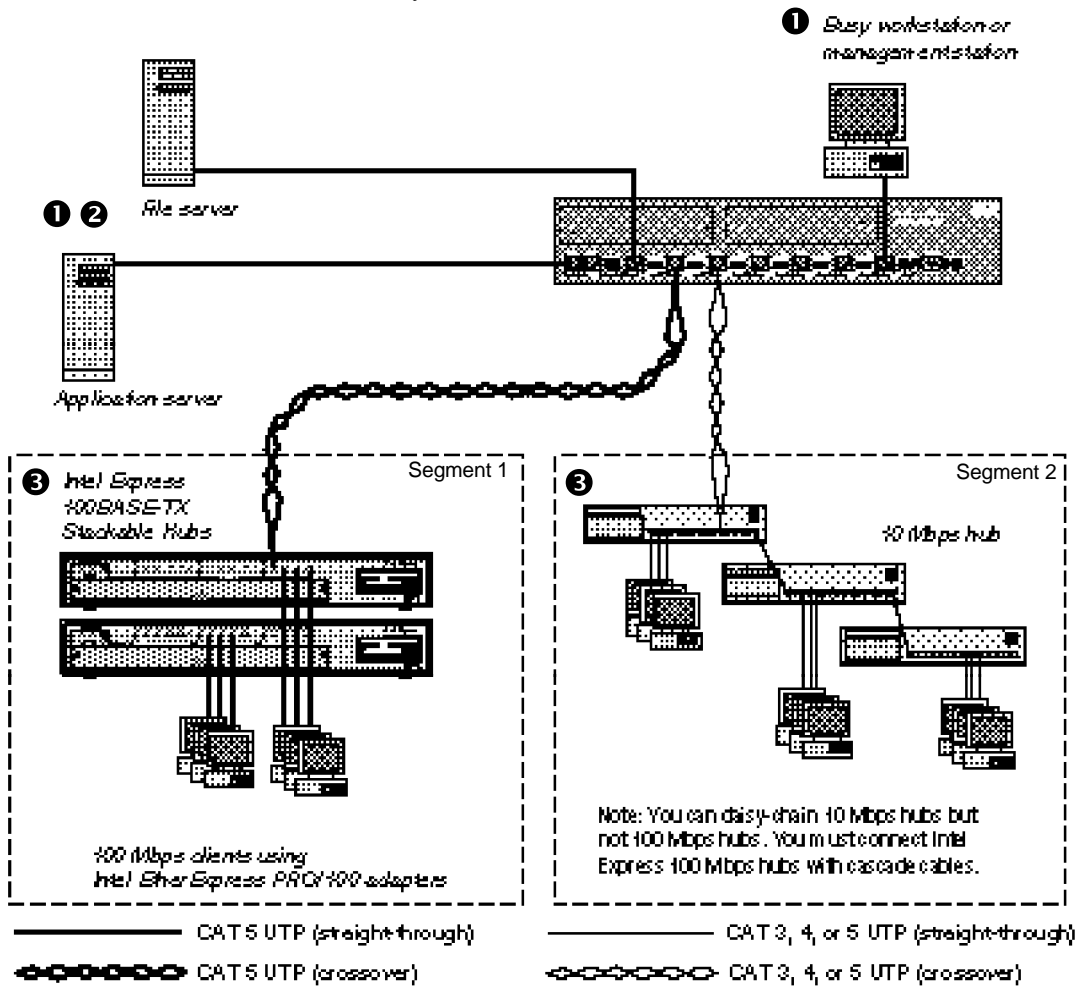
For this connection	Use this cable
Switch to repeater	Crossover
Switch to server or workstation	Straight-through
Switch to switch	Crossover
Repeater to server or workstation	Straight-through

Port 1 on the switch has both an MDI and MDI-X connector. If you're not seeing a link on a port, try plugging into each of the port 1 connectors.

Typical Configurations

Configuring the mixed 10 and 100 Mbps workgroup environment

In the mixed 10 and 100 Mbps environment, workgroup clients should be connected to a hubs such as the Intel Express 10/100BASE-TX Stackable Hub. All hub stacks should be connected to the Express 10/100 Switch. Servers or busy workstations should also be connected directly to the 10/100 Switch.



Configuration guidelines:

- ❶ **Servers or workstations:** Configure servers or workstations directly connected to the switch for full duplex. Since the traffic is two-way traffic, you'll see a performance increase with a full duplex configuration. See page 22 for instructions on configuring full duplex.
- ❷ **Security considerations:** If you have concerns about server access or other security issues, configure security virtual LANs (SVLANs) to prevent segments (ports) from accessing other ports. In the example on the previous page, you may want to prevent workstations on the 10 Mbps hub on port 4 from accessing the file server on port 2. See page 23 for more information on configuring SVLANs.
- ❸ **100 Mbps or 10 Mbps hubs:** Leave hubs (repeaters) at half duplex with flow control enabled. Since hubs broadcast traffic among all ports and full duplex requires a point-to-point connection, you can't configure a 10 or 100 Mbps hub for full duplex.

Configuration guidelines:

- ❶ **Fiber optic connections to switches or routers:** Use multi-mode fiber to connect to a router or another switch. You must purchase a 100BASE-FX expansion module separately (Intel order code ES101MAFX). Each module comes with two ports.

If the switch or router is capable of full duplex, the maximum cable length between the two devices is 2 kilometers. At half duplex the maximum is 412 meters.

Two-port 100BASE-TX expansion are also available (Intel order code ES101MATX).

- ❷ **Full duplex and flow control between Express 10/100 switches:** The only time you can configure full duplex and flow control simultaneously is between two Express 10/100 switches. Special information is added to packets between switches to accomplish this. This works with both fiber optic and CAT 5 cabling.
- ❸ **Fiber optic connections to repeaters:** Since repeaters aren't capable of full duplex mode operation, you're restricted to 160 meters of fiber optic cable between the Express Switch and a repeater.
- ❹ **Multi-workgroup server configuration:** Always put servers accessed by multiple workgroups off of the switch. Because the server has a point-to-point connection, you can configure it for full duplex and increase the bandwidth of the connection. Note that the adapter in the server must be capable of full duplex.
- ❺ **Network administrator's workstation:** Connect the administrator's workstation directly to the switch. This reduces the risk of the administrator getting dropped off the network and allows the administrator to get network information faster.
- ❻ **Local workgroup server configuration:** Always connect servers accessed by local workgroups to a hub, not to the switch. This reduces the amount of traffic passing through the switch and improves the performance for all workgroups connected to it. However, if more than one workgroup accesses a server, connect the server directly to the switch.

Repeater count limitations

The switch doesn't count as a repeater. Each port on the switch can support a full Fast Ethernet or Ethernet network.

10BASE-T

There can be four 10BASE-T repeaters/hubs between the switch and any workstation or server. However, only three of the repeaters can have devices attached.

5-4-3-2-1 general rule for 10BASE-T

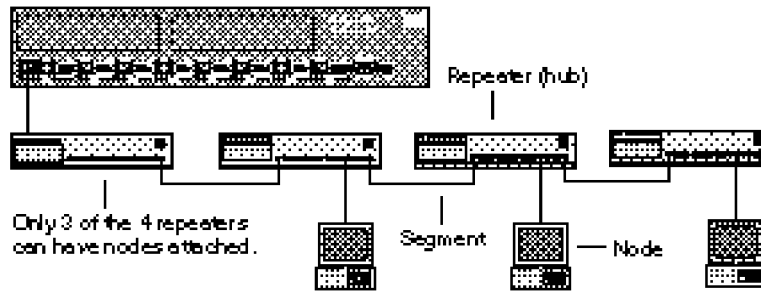
Five segments are allowed

Four repeater hops

Three repeaters can have nodes attached

Two segments can't be populated and are links only

All of this makes *One* collision domain with a maximum of 1024 stations.

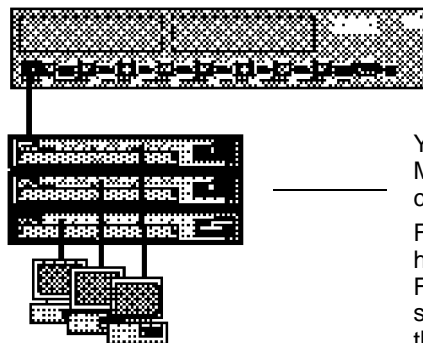


100BASE-TX

There can be one class 1 repeater/hub between the switch and any workstation or server (a stack of Intel Express 100BASE-TX Hubs counts as a single hub). Also, the total diameter of a segment can't exceed 200 meters when using UTP cable. That is, the distance between any two nodes on a segment (or the switch and a node on the other side of a hub) can't exceed 200 meters.

One repeater hop for 100BASE-TX

Only one repeater hop is allowed for 100BASE-TX. Also, the distance between the node and switch can't exceed 200 meters.



You can't daisy-chain 100 Mbps hubs with UTP cable.

For Express 100BASE-TX hubs, use cascade cables. For other 100 Mbps hubs, see the documentation that came with the hub.

2

Configuring and Managing the Switch

You don't need to read this chapter or Chapter 3 unless you want to change the Express 10/100 Fast Ethernet Switch's default configuration (see Appendix A for a list of defaults) or intend to manage the switch. The switch is ready to go simply by plugging it in and turning the power on.

However, if you need to change the default configuration or manage the switch, there are two ways:

- Use SNMP-compliant management software such as Intel LANDesk Network Manager (not included).
- Use the Express 10/100 Switch's internal Console Manager either by directly connecting a serial cable or through Telnet.

To use SNMP management software or Telnet to the switch, you must first connect to the switch using a serial cable and use the Console Manager to assign an IP address.

NOTE

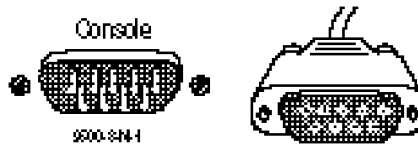
For more information about any of the commands used in this chapter, see Chapter 3, Console Command Reference.

Accessing the Console Manager

The Console Manager software is contained in the switch's nonvolatile RAM (NVRAM). You don't need to install any software.

To access the Console Manager:

- 1 Use the null-modem cable (included with the switch) to connect a workstation's COM port to the Console port on the switch.



- 2 Open a terminal emulation program (such as HyperTerminal in Windows 95).

- 3 Select the COM port and these communication parameters:

9600 baud, 8 data bits, no parity, 1 stop bit, Xon/Xoff flow control

(To set these parameters in HyperTerminal, choose Properties from the File menu. Then click the Configure button.)

- 4 Press *E* . The login prompt appears:

```
Please Login
username:
password:
```

By default, no username or password is assigned. If you enter a password, it becomes active only after you reset the switch or turn off the power. If you want the password to take effect immediately, use the `set-passwd` command.

NOTE

In HyperTerminal, you must set flow control (unrelated to the switch's flow control feature) to Xon/Xoff.

Accessing the Console Manager remotely

To access remotely through Telnet, first set the IP configuration of the switch using the `set-ip-conf` command through the Console port (see page 21 for instructions). Then use Telnet to reach the switch.

All commands work as if a terminal were directly connected to the Console port. Only one console session can be active at a time (either local or remote). After the first Telnet session is established, other Telnet connections are refused until the current session is closed.

Using the Console Manager

The Console Manager provides an out-of-band (not on the network) connection to the switch. Use the Console Manager to

- assign an IP configuration to the switch.
- configure the ports.
- monitor network performance.
- create VLANs.

Entering commands

To enter commands, type the command name followed by any parameters and press *E*. For example, typing `sys-stat E` at the command prompt displays basic system status information.

Items in angle brackets mean you need to enter a specific value. For example, `<IPaddress>` represents an IP address in dotted decimal notation (such as 123.1.1.7).

Items in { } and separated by | represent alternatives for an argument. For example,

```
get-comm {read|write|*}
```

means you can type one of the following

```
get-comm read
get-comm write
get-comm *
```

If you enter a command incorrectly, a message indicates the type of error. For example, typing a nonexistent command gives the message:

```
SYS_console> pin
command <pin> not found
```

Entering an existing command with an incorrect number of parameters displays this message:

```
SYS_console> ping
too few arguments
```

Some commands have parameters that determine how settings are saved and when they're implemented. Some are changed in

- the running configuration so that the new value is used immediately (the `run` option).
- the NVRAM so that the changes are saved and occur only in the next session (the `nvr` option).
- both the running and the NVRAM configuration (the `all` option).

For an explanation of a command's parameters, add a question mark (?) after the command name:

```
SYS_console> set-lt-age ?
set-lt-age      sets the LT aging period
  [arg #0]      database type - either {run|nvr|all}
  [arg #1]      aging time in seconds
```

The Console Manager provides a history of the last several commands you entered. To cycle through them, press `!` or `C P` at the prompt.

To correct a command line, use the following special keys (see the `help-kbd` command):

- `!` or `C P` for the previous command
- `C W` to delete the previous word
- `C U` to delete the entire line

When you type a command that results in more than one screen of text appearing, you can press `Q` to stop the process or any other key to continue to the next screen.

You can press `T` to see the list of commands that start with the text already typed. For example:

```
SYS_console> get-c T
                Commands matching <get-c>
-----
get-comm        show current read or/and write community
get-con-matrix  displays the VLAN connectivity matrix
get-colls-cnt  gets the collision distribution counters per port
```

Console Manager command groups

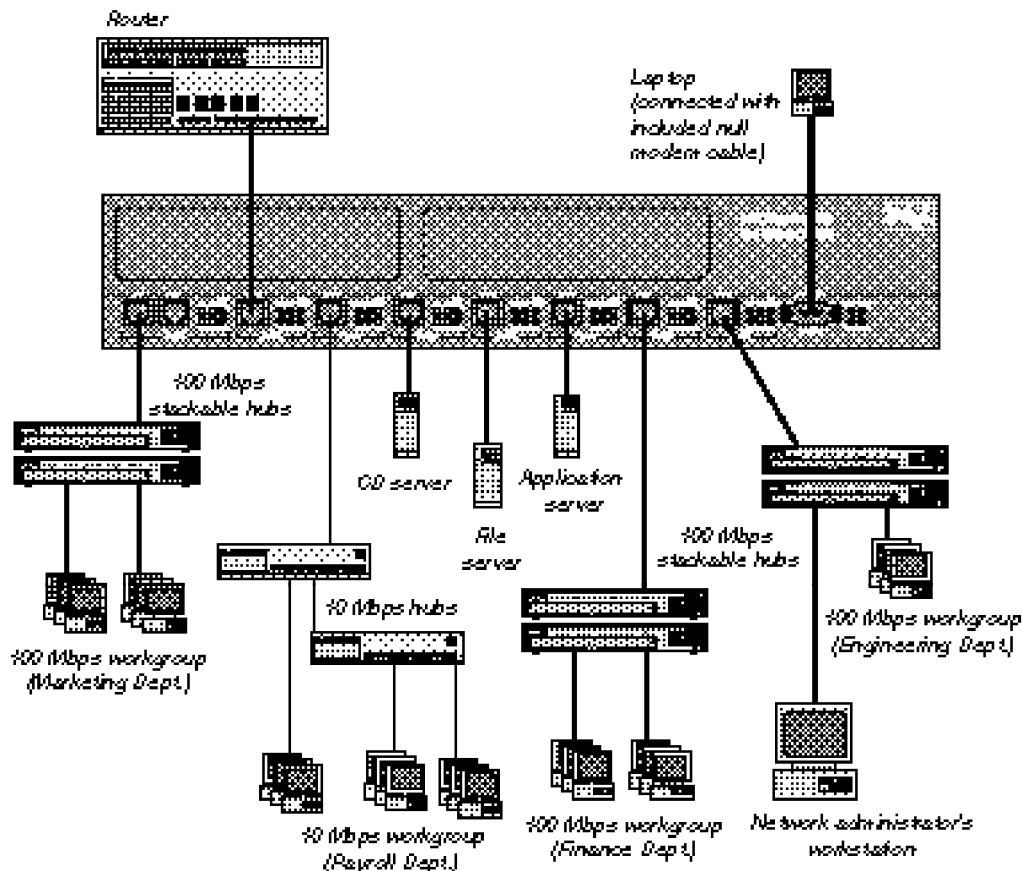
The Console Manager has several categories of commands:

- **Console commands:** help, banner, login/logout, console parameters setup.
- **System commands:** system status, reset commands, download commands, and system debug commands.
- **IP commands:** IP address setup, parameter and information display, and remote boot setup.
- **SNMP agent commands:** SNMP community string settings, management, and trap options.
- **Switching database commands:** aging time management and switching database entry management.
- **VLAN commands:** management of security virtual LANs, virtual broadcast domains, and port mirroring commands.
- **Port configuration commands:** duplex, speed, and flow control port settings.
- **Switching statistics commands:** RMON and Ethernet traffic and packet counters.
- **Spanning tree commands:** disabling or manually configuring the spanning tree protocol.

The following example Console Manager session explains some of the more commonly used commands for configuring ports and monitoring traffic statistics. An example network is provided for reference.

Sample Console Manager Session

Refer to the diagram below when reading the sample configuration procedures on pages 21 through 29.



Procedures using this diagram

- Configuring the SNMP agent for IP (page 21)
- Configuring a port for full duplex (page 22)
- Creating VLANs (page 23)
- Monitoring traffic (page 25)

Configuring the SNMP agent for IP

You can monitor and control the switch through any SNMP-compliant network management system (NMS). First, you must configure the SNMP agent by assigning an IP address.

In the diagram on page 20, a laptop is used to connect to the switch's serial port. You must connect directly to the serial port for first-time IP configuration. See page 16 for more information on connecting to the switch via the serial port.

Commands used

```
set-ip-conf <ip address> <netmask> <broadcast address>
ping <ip address> <number|0>
```

NOTE

If you don't specify an IP configuration, the agent won't respond to any in-band requests, including ping messages and network management applications.

To configure the SNMP agent

- 1 Set the IP configuration. Type the command:

```
set-ip-conf 192.1.1.64 255.255.255.0 192.1.1.255
              |           |           |
              IP address netmask broadcast address
```

Replace the numbers with those for your network. If the switch doesn't have an IP configuration (default), then the specified IP configuration is used immediately and saved in NVRAM. 192.1.1.255 is the address of the router in the diagram on page 20.

If you previously assigned an IP configuration, the command changes only the NVRAM. To use the new parameters, reset the switch using the `warm-reset` command.

- 2 Test the installation. Type the command:

```
SYS_console> ping 192.1.1.1 2
```

This example tests connectivity from the switch to the network administrator's workstation (IP address 192.1.1.1). The option 2 tells the switch to send two requests. Use 0 for an endless ping. For more information on the `ping` command, see page 46.

- 3 Download the MIB from Intel's Customer Support World Wide Web site (<http://support.intel.com>). The file is compressed in the file SWCH2MIB.EXE.
- 4 Compile the MIB into your NMS. See your NMS documentation for more information.

You can now access the switch remotely with your NMS or through Telnet.

NOTE

You must have a point-to-point connection to establish a full-duplex connection (shared hubs/repeaters/concentrators aren't capable of full duplex). Additionally, both points of the connection must be configured for full duplex.

NOTE

Setting a port to full duplex automatically disables flow control. Since collisions don't occur on a full-duplex link, flow control isn't possible.

One exception is between two Express 10/100 switches. Special information is added to packets traveling between switches to accomplish this.

Configuring a port for full duplex

Configuring a port for full duplex allows the switch to send and receive packets simultaneously with the destination device. To establish a full-duplex link, the switch and the destination device both must be configured for full duplex.

Additionally, the link must be to a switch, workstation, or server. You can't establish a full-duplex link to a device that broadcasts incoming packets to every port on the device. This excludes shared hubs, repeaters, or concentrators from using full duplex.

Commands used

```
get-port-cfg
set-speed-sel <port> {asense|10|100}
set-port-dplex <port> {full|half}
```

Recommended environments

Full duplex is best when two devices exchange information to and from each other (such as a file server). In the diagram on page 20, the Payroll and Finance 100 Mbps workgroups frequently copy files to and from the file server on port 5.

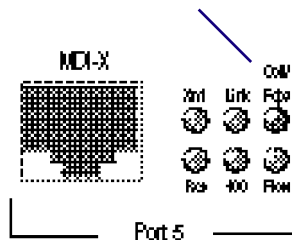
To configure a port for full duplex

- 1 Configure the device on the other end for full duplex. In the diagram on page 20, you'd configure the adapter in the file server for full duplex.
- 2 Get the current port settings using the `get-port-cfg` command. If the port is set to autosense the speed (`asense` is the default) then you must set the speed to either 10 or 100. This example sets port 5 to 100 Mbps.


```
set-speed-sel 5 100
```
- 3 Set the port to full duplex. (This command fails if you haven't manually changed the speed to 10 or 100).


```
set-port-dplex 5 full
```
- 4 Check the Coll/Fdpx LED. It should be solid green, indicating full duplex.

The Coll/Fdpx LED is solid green when the port is configured for full duplex.



Creating Virtual LANs (VLANs)

You can create two types of VLANs:

- **Security VLANs (SVLANs).** Ports in an SVLAN can exchange frames only with other ports in the same SVLAN. SVLANs are used for security to prevent access to devices on the network. They're also used to reduce unnecessary traffic on the network since all traffic, including broadcast and unicast frames, is prevented from crossing SVLAN boundaries.
- **Virtual Broadcast Domains (VBDs).** Ports in a virtual broadcast domain can exchange broadcast frames only with other ports in the same VBD. However, they can exchange unicast frames with any other port on the switch. VBDs reduce broadcast traffic on the network, while allowing other types of traffic to pass through.

Commands used

<code>set-sec-vlan</code>	Sets up an SVLAN.
<code>del-sec-vlan</code>	Deletes an SVLAN.
<code>get-svlan-tbl</code>	Displays the SVLAN table.
<code>set-vbc-domain</code>	Sets up a VBD.
<code>del-vbc-domain</code>	Deletes a VBD.
<code>get-vbc-tbl</code>	Displays the VBD table.

To create an SVLAN

- 1 Determine the ports you want to group together.

In the diagram on page 20, the file server on port 5 contains sensitive information that only the Payroll and Finance workgroups should see. Creating an SVLAN that includes the Payroll and Finance workgroups along with the file server will accomplish this. However, Payroll and Finance still need to communicate with stations on the other ports. Creating another SVLAN that includes all ports except the file server port will solve this problem.

- 2 Create the two SVLANs. Type the commands:

```
set-sec-vlan all 3-5-7
set-sec-vlan all 1-2-3-4-6-7-8
```

These commands create two SVLANs and saves the entries in NVRAM. Replace `all` with `nvr` to save the entry without changing it immediately or with `run` to change the entry now without saving it.

- 3 To display a summary of saved SVLANs, type:

```
get-svlan-tbl nvr
```

Any SVLANs created with the `nvr` or `all` options are displayed.

To create a VBD

- 1 Determine the ports you want to group together.

The Engineering workgroup on port 8 experiences a high volume of traffic just within its own workgroup. Broadcast traffic from other workgroups adds to the problem. By grouping port 8 and port 6 into a VBD, the Engineering workgroup can access the common application server on port 6 while being shielded from the rest of the network's broadcast traffic.

However, this configuration prevents ports 1-4 and 7 from seeing the application server. Another VBD that includes ports 1-4 and 6-7 will allow other ports to reach the file server.

- 2 Type the commands:

```
set-vbc-domain run 6-8
set-vbc-domain run 1-2-3-4-6-7
```

These VBDs are temporary (only until the next reset or power down). To save the entries for future use and have them take effect now, replace `run` with `all`.

- 3 To display a summary of saved VBDs, type:

```
get-vbc-tbl nvr
```

Monitoring traffic

Use monitoring commands to determine the traffic volume from specific ports or between ports. This information helps you determine the network's traffic patterns so you can adjust your network topology for maximum efficiency.

Make sure you get a good statistical representation of your network. Take a reading when users log on in the morning and pull files from servers and another during breaks or when users log off at night—any time you think the network is experiencing heavy traffic. This gives you a baseline for comparison when problems arise on the network.

Statistics are generated for the current session. Reset counters by using the `clr-cnt` command, `warm-reset` command, or by cycling the power.

In general, keep devices that talk primarily to each other on the same segment (remember, each port is an Ethernet segment). For example, if a high volume of traffic is forwarded from the CD server on port 4 to the payroll workgroup on port 3, but no other workgroups access the CD server, move the server to the hub on port 3 instead of the switch. This change may not be efficient, however, if users from the payroll, marketing, or finance workgroups also access the CD server.

Under heavy traffic loading conditions, the Console Manager may understate the Ethernet statistical counts. You can also use a protocol analyzer to monitor the segment the port is attached to. See step 8 on page 72 for configuration details.

Commands used

<code>get-br-cnt <port></code>	Displays the packet statistics for a port.
<code>get-eth-cnt <port></code>	Displays the Ethernet statistics for a port.
<code>get-colls-cnt <port></code>	Displays the collision distribution counters for a port.
<code>get-rmon-cnt <port></code>	Displays the Ethernet RMON counters for a port.
<code>get-sdist-cnt <port></code>	Displays the packet size distribution counters for a port.
<code>get-mgm-brcnt</code>	Displays the statistics for the SNMP agent.
<code>clr-cnt</code>	Resets the Ethernet and bridging statistics.

To check traffic on a port

- 1 Determine the port you want to check.
- 2 Type the command. For example:

```

SYS_console> get-br-cnt 3
Ethernet Switching Counters for port 3
=====
Frm  Received OK :   1419681
Bytes Received   :  842637991
Frm Filtered     :           0
Frm to all ports :           0
Frm multicast    :    16017
Frm lost/fctrl   :           0
Transmit OK      :   1404387
Forward to port  :           FRAMES           BYTES
-----
      1      :           0           0
      2      :           0           0
      3      :   218103808           60
      4      :   1419823      842711315
      5      :           0           0
      6      :           0           0
      7      :           0           0
=====
    
```

In this example, a station on port 3 is accessing a server on port 4. To reduce the amount of traffic crossing the switch, connect the server to a hub on port 3 instead of a hub on port 4. This keeps traffic localized to the same segment.

- 3 Repeat steps 1 and 2 for each port on the switch and for each command listed on the previous page.

Interpreting Statistics

Detecting faulty adapters or hub ports

If **Too Long errors** or **Jabbers** (packets that are too long and misaligned) occur consistently on a port, the connected node may have a faulty adapter or port.

If the adapter works properly in other computers, there are other possible causes you can check:

- Is the cable connecting the node too long? UTP cable can't exceed 100 meters and must be CAT 5 when running at 100 Mbps.
- Is there a duplex mismatch with the switch? If a switch port is set to full duplex and connected to a node set to half duplex, or vice versa, you could see problems. Hubs such as the Intel Express Stackable hub can only be half duplex.

Detecting bad or poor quality cable

If a high percentage of **CRC Errors** with respect to **Transmit OK** occur, it could indicate poor quality cable or a noisy environment. Test the cable with a cable tester or try a different cable.

Detecting congested segments

If a high percentage of **Exces Coll Errors** or **Exces Fctrl Errors** with respect to **Transmit OK** occur, it could indicate a congested segment. Balance the traffic load by moving the destination devices to local segments. If the port is attached to a workstation, server, or switch (not a repeater), change the connection to full duplex mode.

Detecting speed mismatches

If a high amount of **Alignment Errors**, **Runt Errors**, or **Too Long Errors** occur, it could indicate a speed mismatch. Check the speed of the port and all devices connected to that segment.

Statistic Definitions

Transmit OK: The number of valid frames sent from the port.

Underflow Errors: Internal error. A normal ratio of this counter to the Transmit OK counter is 1% or less.

Exces Coll Errors: Increments when the port unsuccessfully transmits a packet 16 consecutive times.

Exces Fctrl Errors: Increments when the port applies flow control 16 consecutive times. See page 73 for more information.

Receive EOF: Total number of frames received at this port.

Receive OK: The number of valid frames received at this port.

Overflow Errors: Internal error. A normal ratio of this counter to the Transmit OK counter is 1% or less.

CRC Errors: The number of packets received that had a length (excluding framing bits, but including FCS octets) of between 64 and 1518 octets and had a bad Frame Check Sequence (FCS) with either an FCS Error or an Alignment Error.

Alignment Errors: The number of frames detected that contain partial octets and don't pass the FCS check.

Runt Errors: The number of frames detected that are less than the minimum permitted frame size and have a good FCS.

Lost/Fctrl Errors: The number of packets lost (if flow control is disabled) or number of packets retransmitted by the originator due to flow control (if flow control is enabled).

Too Long Errors: The number of frames detected that exceed the maximum permitted frame size.

etherStatsOctets: The number of octets (bytes) of data (including those in bad packets) received on the network (excluding framing bits but including FCS octets).

etherStatsPkts: The number of packets received by the port. This is not a good indication of total network traffic since packet vary in size. The number of octets gives a better estimate of network traffic.

etherStatsBcastPkts: The number of frames that are detected without errors and are directed to the broadcast group address. Doesn't include multicast frames or frames received with Too Long, Runt, FCS, or Alignment errors.

etherStatsMcastPkts: The number of frames that are detected without errors and are directed to a non-broadcast group address. This doesn't include frames received with Too Long, Runt, FCS, or Alignment errors.

etherStatsCRCAlignPkts: The number of packets received that had a length (excluding framing bits, but including FCS octets) of between 64 and 1518 octets and had a bad Frame Check Sequence (FCS) with either an FCS error or an Alignment error.

etherStatsUndersizePkts: The number of packets received that were less than 64 octets long (excluding framing bits, but including FCS octets) but were otherwise well-formed.

etherStatsOversizePkts: The number of packets received that were longer than 1518 octets (excluding framing bits, but including FCS octets) but were otherwise well-formed. Might indicate VLAN frames entering the port.

etherStatsRuntPkts: The number of frames detected that are less than the minimum permitted frame size and have a good FCS.

etherStatsJabberPkts: The number of packets received that were longer than 1518 octets (excluding framing bits, but including FCS octets), and had a bad Frame Check Sequence (FCS) with either an FCS error or an Alignment error. The allowed range to detect jabber is between 20 and 150 ms. This is usually caused by a malfunctioning network adapter.

etherStatsCollisions: The number of collisions on this Ethernet segment (port).

etherStatsPkts64Octets: Number of packets 64 octets in length (the minimum size of an Ethernet packet).

etherStatsPkts65to127Octets: Number of packets 65 to 127 octets in length.

etherStatsPkts128to255Octets: Number of packets 128 to 255 octets in length.

etherStatsPkts256to511Octets: Number of packets 256 to 511 octets in length.

etherStatsPkts512to1023Octets: Number of packets 512 to 1023 octets in length.

etherStatsPkts1024to1518Octets: Number of packets 1024 to 1518 octets in length (1518 is the maximum size of an Ethernet packet).

3

Console Command Reference

Type ? at the Console Manager prompt to display the list of available command groups and a short explanation of each. Type the name of a group to display commands relevant to that group.

```
SYS_console> ?  
          Commands groups are:  
-----  
console      Console related commands  
system       System related commands  
ip           IP related commands  
snmp        SNMP related commands  
switch-db    Switching Database related commands  
vlan        Virtual LANS related commands  
port-cfg     Port Configuration related commands  
statistics   Switching Statistics related commands  
sp-tree     Spanning Tree related commands  
-----  
use ! for prev. cmd, ^U to clr line, ^W to clr previous word  
-----
```

When you find the command you want, type its name followed by ? for a description of command syntax.

Console Command-line Summary

Console Commands

`help-kbd`

Lists the help and shortcut keys.

`banner`

Displays the Console Manager logo.

`clear`

Clears the screen.

`login`

Exits Console Manager and displays the login screen.

`logout`

Exits Console Manager and any active Telnet session.

`set-prompt <new_prompt>`

Changes the console prompt.

`set-passwd`

Changes the console password.

System Commands

`sys-stat`

Displays system status.

`get-stst-level`

Displays the selftest level.

`set-stst-level {none|short|long}`

Changes the selftest level.

`warm-reset`

Performs a warm reset of the switch.

`cold-reset`

Performs a cold reset of the switch, which is the same as powering it off then on again.

`get-last-err`

Displays information about the last fatal error.

`init-nvram`

Resets nonvolatile RAM (NVRAM) to default values.

`set-line-slip {9600|19200|38400}`

Transfers the serial connection to SLIP mode and sets the baud.

`get-sw-file`

Displays the SNMP agent software filename.

`set-sw-file <filename>`
 Sets the SNMP agent software filename for download.

`get-rsw-file`
 Displays the SNMP agent software remote filename.

`set-rsw-file <filename>`
 Sets the SNMP agent software remote filename for download.

`get-tftp-srvr`
 Displays the IP address of the TFTP server.

`set-tftp-srvr <IPaddress>`
 Sets the TFTP download server IP address.

`sw-dnld`
 Starts the SNMP software download from the defined TFTP server.

`get-par-file`
 Displays the SNMP agent parameters filename.

`set-par-file <filename>`
 Sets the SNMP agent parameters filename for automatic setup.

`set-fg-param <dest> <source> <fill_byte> <length>`
 Sets the Ethernet frame generator parameters.

`start-fg <dport-bitmask> <count> <rate>`
 Starts the Ethernet frame generator.

`stop-fg`
 Stops the Ethernet frame generator.

IP Commands

`get-ip`
 Displays the current IP address.

`set-ip <IPaddress>`
 Sets the IP address.

`get-ip-conf`
 Displays the current IP address, netmask, and broadcast address.

`set-ip-conf <IPaddress> <netmask> <broadcast>`
 Sets the IP address, netmask, and broadcast address.

`set-slip <IPaddress>`
 Sets the SLIP address.

`get-slip`
 Displays the SLIP address.

`get-slip-conf`
 Displays the current SLIP configuration.

`set-slip-conf <IPaddress> <netmask> <broadcast>`
Sets the SLIP configuration.

`get-gatew`
Displays the default gateway.

`set-gatew <IPaddress>`
Sets the default gateway.

`get-arp-tbl`
Displays the Address Resolution Protocol (ARP) table.

`del-arp-entry <IPaddress|*>`
Deletes one or all entries from the ARP table.

`add-arp-entry <IPaddress> <mac_address> <port>`
Adds an entry to the ARP table.

`get-bootp`
Displays the state of the BOOTP process.

`set-bootp`
Enables or disables the BOOTP process.

`ping <IPaddress> {<number>|0}`
Contacts another IP device.

`ping-stop`
Stops the ping process.

`get-def-ttl`
Displays the running default TTL (time to live) value.

`set-def-ttl <number>`
Modifies the running default TTL value.

SNMP Commands

`get-comm`
Displays the current read or write community.

`set-comm {read|write} <community-string>`
Changes the read or write community.

`get-auth`
Displays the trap authentication mode.

`set-auth {on|off}`
Sets the trap authentication mode.

`get-traps`
Displays the destination stations in the trap list.

`add-trap <IPaddress> <trap-community>`
Adds a destination station to the trap list.

`del-trap <IPaddress>`
Deletes a destination station from the trap list.

Switching Database Commands

`get-lt-entry <index>`
 Displays a switching database entry.

`get-lt-16 {<index>|*}`
 Displays 16 switching database entries starting at a given item number.

`find-lt-addr <mac_address>`
 Searches for an address in the switching database.

`del-lt-entry <index>`
 Removes a switching database entry.

`del-lt-addr <mac_address>`
 Removes the switching database entry for a given address.

`add-lt-entry <mac_address> {lock-off|lock-on} <dport>`
 Adds a switching database entry.

`add-cf-entry {lock-off|lock-on|perm} <mac_address> <sport> <dport>`
 Adds a custom filter entry.

`del-cf-entry {run|nvram} <mac_address> <sport>`
 Deletes a custom filter entry.

`get-nv-cftbl`
 Displays the saved custom filters table.

`get-nv-cfilt <mac_address>`
 Displays the saved custom filters for a given MAC address.

`get-lt-age`
 Displays the switching database aging period.

`set-lt-age {run|nvram|all} <aging_time>`
 Sets the switching database aging period.

Virtual LAN (VLAN) Commands

`set-vbc-domain {run|nvram|all} <port_list>`
 Defines a Virtual Broadcast Domain (VBD).

`del-vbc-domain {run|nvram|all} <domain_id>`
 Deletes a VBD.

`get-vbc-tbl {run|nvram}`
 Displays the VBD table.

`set-sec-vlan {run|nvram|all} <port_list>`
 Defines a Security Virtual LAN (SVLAN).

`del-sec-vlan {run|nvram} <lan_id>`
 Deletes an SVLAN.

`get-svlan-tbl {run|nvram}`
 Displays the SVLAN table.

`set-mon-port <port>`
 Sets the monitoring port.

`monitor <port>`
 Starts port monitoring.

`stop-mon`
 Stops port monitoring.

`get-lt-filter <mac_address>`
 Displays the filter for a given MAC address.

`get-con-matrix`
 Displays the VLAN connectivity matrix.

`get-vbc-matrix`
 Displays the VBC connectivity matrix.

Spanning Tree Commands

`get-stp`
 Displays the spanning tree session state.

`set-stp {enable|disable}`
 Enables or disables the spanning tree for the next session.

`get-st-bcfg`
 Displays the spanning tree bridge parameters.

`get-st-pcfg`
 Displays the spanning tree port parameters table.

`get-st-syscfg`
 Displays the spanning tree system ports configuration.

`set-br-prio <priority>`
 Sets the spanning tree bridge priority.

`set-br-maxage <maxage>`
 Sets the spanning tree bridge maximum age.

`set-br-hellot <hello_time>`
 Sets the spanning tree bridge hello time.

`set-br-fwdel <forward_delay>`
 Sets the spanning tree bridge forward delay.

`set-prt-prio <port_number> <port_priority>`
 Sets the spanning tree port priority.

`set-prt-enb <port_number> {enable|disable}`
 Enables or disables the spanning tree port.

`set-prt-pcost <port_number> <path_cost>`
 Sets the spanning tree port path cost.

Port Configuration Commands

`get-port-cfg`

Displays the configuration of all the ports.

`set-port-dplex <port-number> {half|full}`

Sets a port's duplex mode to half or full.

`set-speed-sel <port-number> {asense|10|100}`

Sets a port's speed to 10, 100, or auto detect.

`set-port-fctrl <port-number> {on|off}`

Sets a port's flow control on or off.

Switching Statistics Commands

`clr-cnt`

Resets the counters for Ethernet and bridging statistics.

`get-eth-cnt <port-number>`

Displays the Ethernet statistics for a port.

`get-colls-cnt <port-number>`

Displays the collision distribution statistics for a port.

`get-rmon-cnt <port-number>`

Displays the Ethernet RMON statistics for a port.

`get-sdist-cnt <port-number>`

Displays the packet size distribution statistics for a port.

`get-br-cnt <port-number>`

Displays the switching statistics for a port.

`get-mgm-brcnt`

Displays the switching statistics of the management port.

Console Commands

help-kbd

Lists the console function keys.

```
SYS_console> help-kbd
? or TAB - for a list of the categories
! or ^P - for previous command
TAB      - for command completion
^U      - to clear the line
^W      - to clear the previous word
```

banner

Displays the Express 10/100 Switch Console Manager logo.

clear

Clears the screen and displays the command prompt.

login

Exits the Console Manager, but doesn't disconnect a Telnet session. Use this command to password protect the console terminal while a Telnet session is running.

logout

Ends the local Console Manager session and any Telnet session. Displays the login prompt for a new session if connected locally.

set-prompt

```
set-prompt <new_prompt>
```

Sets the command-line prompt for the Console Manager to a more meaningful prompt, such as the location of the switch or the name of a workgroup. The default prompt is `SYS_console>`.

```
SYS_console> set-prompt R&D_grp>
CLI prompt change in the NVRAM OK
R&D_grp>
```

set-passwd

Changes the console password. The system first prompts you for the old password. You then type a new password and retype it for verification. Passwords never appear on the screen.

```
SYS_console> set-passwd
Enter old password:
Enter new password:
Enter new password again:
  CLI running password changed
  CLI password change in the NVRAM OK
```

If you enter the old password incorrectly or don't verify the new password correctly, the password isn't changed.

System Commands

sys-stat

Displays general status information about the switch and its SNMP agent hardware and software:

```
SYS_console>sys-stat
  Intel Express 10/100 Fast Ethernet Switch
  SNMP Agent Software - Version <version>
  SNMP Object ID is : < .1.3.6.1.4.1.629.1.1.3 >
  System MAC Address : 00-A0-C9-00-20-D9
  Switching Data Base Size : 4096 entries
  Total uptime(hundredths of seconds ): 111151888
  Total uptime(days, hh:mm:ss format): 12 days, 20:45:18.88
i/f 1 -- description [ Port 1 - 10/100 BaseTx Ethernet Port ] -- status [up]
i/f 2 -- description [ Port 2 - 10/100 BaseTx Ethernet Port ] -- status [up]
i/f 3 -- description [ Port 3 - 10/100 BaseTx Ethernet Port ] -- status [up]
i/f 4 -- description [ Port 4 - 10/100 BaseTx Ethernet Port ] -- status [up]
i/f 5 -- description [ Port 5 - 10/100 BaseTx Ethernet Port ] -- status [up]
i/f 6 -- description [ Port 6 - 10/100 BaseTx Ethernet Port ] -- status [up]
i/f 7 -- description [ Port 7 - 10/100 BaseTx Ethernet Port ] -- status [up]
i/f 8 -- description [ Port 8 - 10/100 BaseTx Ethernet Port ] -- status [up]
i/f 9 -- description [ Port 9 - missing ] -- status [DOWN]
i/f 10 -- description [ Port 10 - missing ] -- status [DOWN]
i/f 11 -- description [ Port 11 - missing ] -- status [DOWN]
i/f 12 -- description [ Port 12 - missing ] -- status [DOWN]
```

The screen displays the following information:

- SNMP agent software version and release date.
- Device SNMP object ID.
- Device MAC address.
- System uptime (in 1/100 of a second) and in days, hours, minutes, and seconds.
- Port description and status. Ports 9 through 12 are labeled as “missing” unless you have optional media adapters installed.

get-stst-level

Displays the self-test level set by the `set-stst-level` command.

set-stst-level

```
set-stst-level {none|short|long}
```

Changes the self-test level. The switch performs a self-test each time you reset it with the `cold-reset` command or when you cycle the power. The default is `none`.

warm-reset

Resets the SNMP agent software without resetting the switch (it doesn't disconnect existing connections). The switch configuration is loaded from the values saved in NVRAM. This command also resets the statistics counters.

cold-reset

Performs a cold reset, which is the same as turning the power off then on again. Any existing connections are lost and the statistics counters are reset.

get-last-err

Displays the most recent system failure, if any, for diagnostic purposes.

```
SYS_console>get-last-err
System information since the last hardware reset
-----
Software resets number : 0
The system never encountered a fatal error
```

init-nvram

Resets the NVRAM on the SNMP agent to the default values. The changes don't take effect until you use the `warm-reset` or `cold-reset` commands or cycle the power. Appendix A lists the default values.

set-line-slip

```
set-line-slip {9600|19200|38400}
```

Changes the console serial port to SLIP mode for out-of-band SNMP management. The command argument is the new baud for the interface. You can use SLIP with a terminal server but not with a modem. Configure the SLIP interface using the `set-slip-conf` console command. Return the serial port to console mode by pressing *E* three consecutive times from a terminal.

```
SYS_console> set-line-slip 9600
RS232 baudrate in SLIP mode changed to 9600 bps
To switch back to Administrative Interface Mode press <CR> three
times. Note that the Administrative Interface Mode baudrate will
be 9600
```

get-sw-file

Displays the name of the SNMP agent software file. The file is stored internally in the switch.

set-sw-file

```
set-sw-file <filename>
```

Sets the name of the file to be downloaded by TFTP (trivial file transfer protocol). Use this command to update the switch's firmware. The filename must match the name of the agent software file on a TFTP server. When you use TFTP, increase the per-packet retransmission time-out value on the TFTP server (not the switch) to 10 seconds, because the SNMP agent must first erase its flash EEPROM, which takes about 30 seconds.

get-rsw-file

Displays the name of the SNMP agent software remote file. If you don't define one with the `set-rsw-file` command, the switch uses its internal file.

set-rsw-file

```
set-rsw-file <filename>
```

Sets the name of the SNMP agent software remote file for download. This is the file downloaded from a TFTP server, if you've defined one.

get-tftp-srvr

Displays the TFTP server IP address to be used for downloading SNMP agent software.

set-tftp-srvr

```
set-tftp-srvr <IPaddress>
```

Sets the TFTP server IP address to be used for downloading SNMP agent software.

sw-dnld

Starts the SNMP software download from the defined TFTP server.

get-par-file

Displays the name of the SNMP agent parameter file.

set-par-file

```
set-par-file <filename>
```

Sets the name of the SNMP agent parameter file to be downloaded by BOOTP. The filename must match the name of the parameter file on the BOOTP server. The format for the parameter file is:

```
<switch_hardware_address> : <read_comm> : <write_comm>
```

Example:

```
00-A0-C9-00-01-23 : public : private
```

You can find the *switch_hardware_address* by using the *sys-stat* command (it's the system MAC address).

set-fg-param

```
set-fg-param <dest> <source> <fill_byte> <length>
```

Sets the frame generator parameters. The *dest* and *source* are dash-separated MAC addresses. The *fill_byte* is a single byte used to fill the entire packet except for the first 12 bytes. The *length* is the total length of the packet excluding CRC.

start-fg

```
start-fg <dport-bitmask> <count> <rate>
```

Starts frame generation. *dport-bitmask* is a hex bitmask of the ports to generate traffic on. For example, a *dport-bitmask* of 3E sends frames to ports 2, 3, 4, 5, 6. The *count* specifies the number of frames to send on each port. A count of 0 sends packets until you type the `stop-fg` command. The *rate* specifies the number of packets per second to generate.

stop-fg

Stops the frame generator.

IP Commands

This section lists the available IP commands. In the sections that follow, IP Configuration lists general configuration commands, Ping lists commands that describe the ping ability of the agent, and Address Resolution Protocol lists ARP commands.

IP configuration

get-ip

Displays the switch's current IP address:

```
SYS_console> get-ip
The device IP address is: 192.001.001.064
SYS_console> _
```

If the switch doesn't have an IP address assigned:

```
SYS_console> get-ip
The device has no IP address defined.
```

get-ip-conf

Displays the complete current IP configuration: IP address, netmask (subnet mask), and broadcast address (default gateway).

```
SYS_console> get-ip-conf
The device IP address, netmask and broadcast are:
IP address   : 192.001.001.064
IP netmask   : 255.255.255.000
IP broadcast : 192.001.001.255
```

set-ip

```
set-ip <IPaddress>
```

Sets the IP address of the switch (technically, the switch's SNMP agent). If no IP address was previously set (default configuration), the new value is saved in NVRAM and used immediately. Otherwise, the new value is stored in NVRAM, but you must use the `warm-reset` command or cycle the power for changes to take effect.

```
set-ip 192.001.001.064
Device IP Address unchanged for this session
Device IP Address change in the NVRAM OK
The device NVRAM IP address will be:
    IP address   : 192.001.001.064
```

set-ip-conf

```
set-ip-conf <IPaddress> <netmask> <broadcast>
```

Sets the IP address, netmask (subnet mask), and broadcast IP address. If no IP configuration was previously set (default configuration), the new values are saved in NVRAM and used immediately. Otherwise, the new values are stored in NVRAM, but you must use the `warm-reset` command or cycle the power for changes to take effect.

```
SYS_console> set-ip-conf 192.1.1.64 255.255.255.0 192.1.1.255
Device IP Address set for this session
Device IP Address change in the NVRAM OK
The device IP configuration in the next session will be:
    IP address   : 192.001.001.064
    IP netmask   : 255.255.255.000
    IP broadcast : 192.001.001.255
```

get-bootp

Displays the current state of the BOOTP process. By default, BOOTP is disabled.

set-bootp

```
set-bootp {enable|disable}
```

Enables or disables BOOTP. With BOOTP enabled, the switch looks for a BOOTP server at startup if no IP configuration is defined.

get-slip

Displays the current SLIP address. By default, no SLIP address is assigned.

get-slip-conf

Displays the current SLIP configuration.

set-slip

```
set-slip <IPaddress>
```

Sets the SLIP address, which can't be the same as the IP address.

set-slip-conf

```
set-slip-conf <IPaddress> <netmask> <broadcast>
```

Sets the SLIP configuration. The arguments are the same as `set-ip-conf`.

get-gatew

Displays the default gateway. Use this default router when accessing a different IP network.

set-gatew

```
set-gatew <IPaddress>
```

Sets the default gateway IP address, which specifies the router used to access a different IP network. The default value for this setting is 0.0.0.0 (no gateway). You can also set the default gateway using the `set-ip-conf` command.

```
SYS_console> set-gatew 192.1.1.255
Device Default Gateway change in the NVRAM OK
Device Default Gateway changed to : 192.1.1.255
SYS_console> get-gatew
Device default gateway address is: 192.001.001.255
```

get-def-ttl

Displays the default IP time-to-live (TTL) value. This value (from 1 to 255) is the number of routers a frame can go through before being dropped. The default is 255.

set-def-ttl

```
set-def-ttl <number>
```

Modifies the default TTL value, from 1 to 255 router hops allowed.

Ping Commands

The `ping` command sends an Internet Control Message Protocol (ICMP) echo request packet to a station. The ping process is asynchronous, so any responses are mixed in with other system console messages. For this reason, it's best to avoid typing other commands (except `ping-stop`, which cancels the ping) while the process is active.

ping

```
ping <IPaddress> {<number>|0}
```

You can ping a device (at *IP address*) a *number* of times or 0 for endless ping. The ping process sends a *number* of datagrams, one per second. One line of output appears for every response received. Normal response time is 1 to 10 seconds.

The ping command tests the connectivity between the switch and an IP station. It is not intended as a traffic generator, so it's best to avoid using an endless ping. To stop the ping, use `C C` or enter the `ping-stop` command.

```
SYS_console> ping 192.1.1.1 10
129.001.001.001 Alive. echo reply: id 297, seq 4, echo-data-len 8
PING process stopped - press <CR> for prompt
    - press <CR> to get the prompt again
```

If the IP station doesn't respond, the console prompt appears and no output is added. Failure to get an echo response from an IP station may be due to the following:

- A bad physical connection.
- A nonexistent or inactive IP station.
- Network unreachable: no corresponding entry in the routing table.
- Destination unreachable: the default gateway failed to route the datagram.
- Outdated Address Resolution Protocol (ARP) table information. Clear the ARP table with the `del-arp-entry` command.

If there's an active ping process due to a previous "long" ping command and you try to start a new ping, the command fails.

ping-stop

Stops the active ping process. You can also press `C C`.

Address Resolution Protocol (ARP) Commands

get-arp-tbl

Displays the ARP table. The table lists the port and MAC address for each IP address the switch has communicated with recently.

```
SYS_console> get-arp-tbl
```

IfIndex	IpAddress	MAC Address
1	129.001.001.001	00-40-05-2D-73-9C
1	129.001.001.200	00-02-A0-D4-9A-57

add-arp-entry

```
add-arp-entry <IPaddress> <mac_address> <port>
```

Adds an entry to the ARP table manually. *port* is the switch port the device is connected to.

del-arp-entry

```
del-arp-entry {<IPaddress>|*}
```

Deletes entries from the ARP table. If you enter an IP address, the matching ARP entry is deleted. If you enter *, the entire ARP table is cleared.

Use this command if the network topology physically changes. For example, when a management station moves from one segment to another and its port number changes.

CAUTION

The `del-arp-entry` command is very powerful, allowing you to change the entire switching database with the exception of the system MAC addresses. Use it with caution.

SNMP Commands

Use these commands to configure the SNMP agent itself — access and trap configuration.

SNMP community strings

SNMP community strings authenticate access to the Management Information Base (MIB). Community strings function as “passwords” embedded in every SNMP packet. The community string must match a community strings configured in the switch before the message can be processed. There are two community strings, one for the two types of access:

- `read` mode permits read access to all the objects in the MIB, but doesn’t allow write access.
- `write` mode permits read and write access to all objects in the MIB.

get-comm

```
get-comm {read|write|*}
```

Displays the SNMP community string for a given access mode (read or write). If the access mode is specified as *, both read and write community strings are displayed.

```
SYS_console> get-comm *  
Current read community is: < public >  
Current write community is: < private >
```

set-comm

```
set-comm {read|write} <community-string>
```

Specifies the SNMP community string for either of the two access modes (read and write).

```
SYS_console> set-comm write password  
New write community is: < password >
```

SNMP trap message commands

If the switch detects an irregular event, it generates a trap. A trap is a notification message that can be sent to predefined network management stations. A trap event can be a cold or warm reset, detection of a port link status change, an SNMP authentication failure due to an incorrect community string, or similar event.

The SNMP trap commands let you specify

- whether the Express 10/100 Switch issues an authentication trap.
- which NMSs (up to five) the SNMP agent sends traps to.

get-auth

Displays the authentication trap setting. By default, authentication trap messages are enabled.

set-auth

```
set-auth {on|off}
```

Changes the authentication trap setting. The default is `on`, meaning the switch generates authentication traps. Specifying `off` prevents the switch from sending authentication traps.

get-traps

Displays the list of trap-receiving stations (their IP address and trap SNMP community string). By default, none are assigned.

```
SYS_console>get-traps
```

```
                SNMP TRAP TABLE
                =====
                IPADDR                COMMUNITY
-----
192.168.001.065    -----    testing
-----
```

add-trap

```
add-trap <IPaddress> <trap-community>
```

Enters the IP address of the receiving station and the trap community string that appears in the trap message. The trap table can contain up to five receiving stations.

```
SYS_console> add-trap 129.1.1.76 engineering
Entry 129.1.1.76 - rnd added
          SNMP TRAP TABLE
          =====
          IPADDR                                COMMUNITY
-----
129.001.001.065 ----- public
129.001.001.007 ----- trapcomm
129.001.001.076 ----- engineering
-----
```

del-trap

```
del-trap <IPaddress>
```

Removes a station from the trap table.

```
SYS_console> del-trap 129.1.1.7
Entry 129.1.1.7 - trap comm deleted
```

Switching Database Commands

Use the commands listed in this section to manage the switching database.

The switching database is also called a *learn table* or *address table*. Each active entry contains the information relevant to a network node, identified by its Ethernet MAC address. Each entry contains the following information:

Lock. If locked (denoted as a +), the entry is static and isn't deleted by the switch aging process. If unlocked (denoted as a -), the entry is dynamic and is automatically deleted if the workstation is not active during the aging time period.

Self (not user configurable). If on (denoted as a +), the entry is a system address. These are the switch’s individual and group addresses, as well as other addresses added by the management system. If off (denoted as a -), the entry contains the MAC address of a station on the network.

Dport. The destination port where frames from the MAC address are forwarded. This doesn’t apply if the MAC address has a custom filter applied to it.

Mgmt. If on (denoted as a +), frames from the entry are sent to the management port on the switch.

The first section, “Database control commands,” lists commands relevant to standard MAC addresses (for example, determining the behavior of the switch when it sees a particular address). The second section, “Custom filtering,” lists commands pertinent to the custom filtering capabilities of the switch.

Database control commands

get-lt-entry

```
get-lt-entry <index>
```

Displays entry number *index* in the switching database. The index range is 1 to 4096.

```
SYS_console>get-lt-entry 19
```

Entry	MAC Address	LOCK	SELF	DPORT	MGMT
19	00-20-C5-00-59-E6	-	-	5	-

The entry has these properties:

- The entry number is 19.
- The MAC address is 00-20-C5-00-59-E6.
- The entry is dynamic and will be aged out (lock is off).
- It’s not a system address (self is off).
- Frames are forwarded to port 5 only.
- Frames are not forwarded to the management port (mgmt is off).

get-lt-16

get-lt-16 {<index>|*}

Displays 16 switching database entries starting at *index* (or * to continue from the last displayed index).

NOTE

In the example, entries 10-17 are system entries and can't be deleted or modified.

Entries 18 and up are automatically learned MAC addresses, as indicated by lock = OFF (-) and by self = OFF (-).

```
SYS_console>get-lt-16 10
```

Entry	MAC Address	LOCK	SELF	DPORT	MGMT
10	00-20-1A-20-20-D9	+	+	-CUSTOM	FILTER-
11	00-20-1A-24-20-D9	+	+	-CUSTOM	FILTER-
12	00-20-1A-28-20-D9	+	+	-CUSTOM	FILTER-
13	00-20-1A-2C-20-D9	+	+	-CUSTOM	FILTER-
14	00-20-1A-30-20-D9	+	+	-CUSTOM	FILTER-
15	00-20-1A-34-20-D9	+	+	-CUSTOM	FILTER-
16	00-20-1A-38-20-D9	+	+	-CUSTOM	FILTER-
17	FF-FF-FF-FF-FF-FF	+	+	-CUSTOM	FILTER-
18	00-40-05-2D-9D-49	-	-	3	-
19	00-20-C5-00-59-E6	-	-	4	-
20	00-00-92-94-01-54	-	-	1	-
21	00-C0-1D-01-06-20	-	-	1	-
22	00-40-05-2B-0A-26	-	-	5	-
23	00-40-05-29-1E-DE	-	-	7	-
24	00-40-05-2B-17-37	-	-	4	-
25	08-00-20-76-72-89	-	-	2	-

```
SYS_console>get-lt-16 *
```

Entry	MAC Address	LOCK	SELF	DPORT	MGMT
26	00-40-05-11-06-AD	-	-	2	-
27	00-40-05-2B-59-EA	-	-	3	-
28	00-40-05-2D-99-3A	-	-	7	-
29	00-40-05-16-80-7C	-	-	5	-
30	00-00-C0-60-A7-B9	-	-	5	-
31	00-40-05-1A-A1-69	-	-	5	-
32	00-40-05-29-1E-EB	-	-	6	-
33	00-40-05-2E-DF-15	-	-	5	-
34	00-40-05-28-B4-1A	-	-	7	-
35	00-40-05-2F-93-A7	-	-	4	-
36	00-40-33-32-A6-58	-	-	6	-
37	00-40-05-15-70-5E	-	-	5	-
38	00-40-05-1A-A1-5F	-	-	1	-
39	00-40-05-28-B7-2A	-	-	5	-
40	00-40-05-2B-16-3D	-	-	2	-
41	00-40-05-15-B6-83	-	-	4	-

find-lt-addr

```
find-lt-addr <mac_address>
```

Searches for a MAC address in the switching database and displays its description, if found.

```
SYS_console>find-lt-addr 00-40-05-2B-16-3D
Entry ---- MAC Address ---- LOCK SELF DPORT MGMT
=====
40      00-40-05-2B-16-3D   -   -     3     -
```

del-lt-entry

```
del-lt-entry <index>
```

Deletes the specified switching database entry, using the entry number from the `get-lt-16` command. If that entry number is not active, the command has no effect. You can't delete entries with the self field set (system addresses).

```
SYS_console> del-lt-entry 15
Deleting entry at index - 15 - OK
```

del-lt-addr

```
del-lt-addr <mac_address>
```

Deletes the switching database entry that matches the specified MAC address.

```
SYS_console> del-lt-addr 00-40-05-2b-59-4c
Deleting entry with MAC address - 00-40-05-2b-59-4c OK
```

The command fails if the MAC address isn't found in the switching database.

add-lt-entry

```
add-lt-entry <mac_address> {lock-off|lock-on} <dport>
```

Add an entry to the switching database. The lock setting is described at the beginning of this section. *dport* is the destination port number.

```
add-lt-entry 00-A0-C9-00-11-11 lock-off 3
```

This example sends packets from the device with MAC address 00-A0-C9-00-11-11 to port 3. `lock-off` means the entry is deleted if the device is inactive for 300 seconds (the default aging time).

get-lt-age

Displays the switching database aging time in seconds. This is the amount of time the switch stores a device's MAC address before clearing it from the database. An entry whose MAC address doesn't appear in the source field of an incoming packet for this period of time is discarded. The default is 300 seconds.

```
SYS_console> get-lt-age
The running aging time is: 300 seconds
```

set-lt-age

```
set-lt-age {run|nvram|all} <aging_time>
```

Modifies the switching database aging time.

The *aging_time* is in seconds with a default of 300 seconds and a range of 10 to 11,000 seconds. Decrease the time if the number of active workstations is larger than 1024.

```
SYS_console> set-lt-age run 280
Aging Period update in the running database OK
SYS_console> set-lt-age all 100
Aging Period update in NVRAM OK
Aging Period update in the running database OK
```

Custom filtering

Use custom filters to ensure a device can reach other devices regardless of where the device is attached. For example, if you have a laptop computer that acts as a management station, you want to make sure you can reach your servers from anywhere on the network, even from segments that have security VLAN restrictions.

The custom filter entry for an address displays onscreen as a matrix. The source (SRC) column lists the available source ports (1 through 12, where ports 9 through 12 are for optional expansion modules which may not be installed). The other columns each represent an available destination port. A + represents a forwarding path. In the following example, each source port forwards frames to port 5. (A + isn't listed in the P5 column because ports don't forward frames to themselves.)

```

SYS_console> get-lt-filter 00aa00a5898b
12  00-AA-00-A5-89-8B  LOCK_OFF  SELF_OFF  --- VIRTUAL LAN  -----
SRC PORT to : MGMT  P1  P2  P3  P4  P5  P6  P7  P8  P9  P10  P11  P12
=====
  1      -  -  -  -  -  +  -  -  -  -  -  -  -
  2      -  -  -  -  -  +  -  -  -  -  -  -  -
  3      -  -  -  -  -  +  -  -  -  -  -  -  -
  4      -  -  -  -  -  +  -  -  -  -  -  -  -
  5      -  -  -  -  -  -  -  -  -  -  -  -  -
  6      -  -  -  -  -  +  -  -  -  -  -  -  -
  7      -  -  -  -  -  +  -  -  -  -  -  -  -
  8      -  -  -  -  -  +  -  -  -  -  -  -  -
  9      -  -  -  -  -  +  -  -  -  -  -  -  -
 10      -  -  -  -  -  +  -  -  -  -  -  -  -
 11      -  -  -  -  -  +  -  -  -  -  -  -  -
 12      -  -  -  -  -  +  -  -  -  -  -  -  -

```

get-lt-filter

`get-lt-filter <mac_address>`

Displays the custom filter for the specified MAC address. See the previous example.

add-cf-entry

`add-cf-entry {lock-on|lock-off|perm} <mac_address> <sport> <dport>`

Adds a custom filter entry for the specified MAC address. `lock-on` indicates the entry won't be aged out, but will be lost when the switch is reset. `lock-off` indicates the entry can be aged out normally. `perm` indicates the entry is written to NVRAM and remains after a reset.

`sport` is a hexadecimal representation of incoming ports, and `dport` is a hexadecimal bitmask representation of outgoing ports.

Packets arriving at the switch with the destination MAC address from any port specified in `sport` are transmitted to all ports specified in `dport`.

```

SYS_console> add-cf-entry perm 00-AA-00-11-11-11 C C0
Add CF LT entry OK
CF Entry Update in NVRAM OK

```

This custom filter sends packets with destination MAC address 00-AA-00-11-11-11 from port 3 or 4 (hexadecimal C) to ports 6 and 7 (hexadecimal C0).

del-cf-entry

```
del-cf-entry {run|nvram} <mac_address> <sport>
```

Deletes the custom filter entry for address *mac_address* from source port *sport*. Ports are deleted one at a time by entering the port number. Select *run* to delete the entry from the currently running table only. Select *nvram* to remove the entry from the NVRAM as well as the currently running table.

get-nv-cftbl

Displays the custom filter table stored in NVRAM.

```
NVRAM CUSTOM FILTERS TABLE
=====
Entry  ----  MAC Address  ----
-----
      1      00-00-00-11-11-11
```

get-nv-cfilt

```
get-nv-cfilt <mac_address>
```

Displays the custom filter associated with *mac_address* from the custom filter table stored in NVRAM.

VLAN Commands

Use VLANs to limit the broadcast domain and establish security virtual LANs. For procedural information on VLANs, see page 23.

- *run* indicates that only the currently running configuration is changed. A reset doesn't restore the changes.
- *nvram* indicates that only the configuration stored in NVRAM is changed. Changes don't take effect until a reset.
- *all* indicates that both the currently running configuration and the NVRAM configuration is changed. Changes take effect immediately and are restored after a reset.

get-con-matrix

Displays the current connectivity matrix for the switch. The first column is the source port. The other columns are destinations where frames from a given source port can be forwarded. Unlearned addresses (addresses that aren't in the switching database) are forwarded to all ports marked with a + in the source port's row. Learned addresses are forwarded to their destinations only if the destination is marked with a + in the source port's row. Ports don't need to be forwarded to themselves.

```
SYS_console> get-con-matrix
VLAN CONNECTIVITY MATRIX
=====
SRC  PORT to :  P1  P2  P3  P4  P5  P6  P7  P8  P9  P10 P11 P12
=====
1    1          -  +  +  +  +  +  +  +  -  -  -  -
2    2          +  -  +  +  +  +  +  +  -  -  -  -
3    3          +  +  -  +  +  +  +  +  -  -  -  -
4    4          +  +  +  -  +  +  +  +  -  -  -  -
5    5          +  +  +  +  -  +  +  +  -  -  -  -
6    6          +  +  +  +  +  -  +  +  -  -  -  -
7    7          +  +  +  +  +  +  -  +  -  -  -  -
8    8          +  +  +  +  +  +  +  -  -  -  -  -
9    9          -  -  -  -  -  -  -  -  -  -  -  -
10   10         -  -  -  -  -  -  -  -  -  -  -  -
11   11         -  -  -  -  -  -  -  -  -  -  -  -
12   12         -  -  -  -  -  -  -  -  -  -  -  -
```

get-vbc-matrix

Displays the current broadcast domain matrix for the switch. See the `get-con-matrix` command above for a description of the resulting table. Here, only the broadcast address is affected.

```
SYS_console> get-vbc-matrix
VBC CONNECTIVITY MATRIX
=====
SRC  PORT to :  P1  P2  P3  P4  P5  P6  P7  P8  P9  P10 P11 P12
=====
1    1          -  +  +  +  +  +  +  +  -  -  -  -
2    2          +  -  +  +  +  +  +  +  -  -  -  -
3    3          +  +  -  +  +  +  +  +  -  -  -  -
4    4          +  +  +  -  +  +  +  +  -  -  -  -
5    5          +  +  +  +  -  +  +  +  -  -  -  -
6    6          +  +  +  +  +  -  +  +  -  -  -  -
7    7          +  +  +  +  +  +  -  +  -  -  -  -
8    8          +  +  +  +  +  +  +  -  -  -  -  -
9    9          -  -  -  -  -  -  -  -  -  -  -  -
10   10         -  -  -  -  -  -  -  -  -  -  -  -
11   11         -  -  -  -  -  -  -  -  -  -  -  -
12   12         -  -  -  -  -  -  -  -  -  -  -  -
```

set-vbc-domain

```
set-vbc-domain {run|nvram|all} <port_list>
```

Establishes a virtual broadcast domain (VBD). *port_list* is a list of ports, separated by dashes, to group into a broadcast domain.

```
set-vbc-domain all 2-5-6-7
```

This creates a VBD of ports 2, 5, 6, and 7.

del-vbc-domain

```
del-vbc-domain {run|nvram} <domain_id>
```

Deletes a virtual broadcast domain. Use the `get-vbc-tbl` command to see a list of domain ID numbers.

get-vbc-tbl

```
get-vbc-tbl {run|nvram}
```

Displays the list of defined virtual broadcast domains.

```
SYS_console> get-vbc-tbl run
```

```

RUNTIME      VIRTUAL BROADCAST DOMAIN TABLE
=====
VBC ID      P1  P2  P3  P4  P5  P6  P7  P8  P9  P10 P11 P12
=====
1:          -  +  -  -  +  +  +  -  -  -  -  -
    
```

set-sec-vlan

```
set-sec-vlan {run|nvram|all} <port_list>
```

Establishes a Security Virtual LAN (SVLAN). Arguments are identical to `set-vbc-domain`. Ports in an SVLAN can exchange data only with other ports in the same SVLAN.

del-sec-vlan

```
del-sec-vlan {run|nvram} <lan_id>
```

Deletes the SVLAN specified by *lan_id*. Use the `get-svlan-tbl` command to see these ID numbers.

get-svlan-tbl

get-svlan-tbl {run|nvram}

Displays the table of defined SVLANs.

```
SYS_console> get-svlan-tbl run
RUNTIME SECURITY VIRTUAL LANs TABLE
=====

SVLAN ID  P1  P2  P3  P4  P5  P6  P7  P8  P9  P10 P11 P12
=====
1:        +  +  +  -  -  -  -  -  -  -  -  -
2:        +  +  -  -  +  -  -  -  -  -  -  -
```

In this example, ports 1, 2, and 3 are an SVLAN and ports 1, 2, and 5 are an SVLAN. This means that ports 1 and 2 can talk to each other and to ports 3 and 5, but 3 and 5 can't talk to each other.

set-mon-port

set-mon-port <port>

Sets the port to be monitored. *port* is the port number. All traffic from this port is duplicated, or mirrored, on the port specified by the `monitor` command.

monitor

monitor <port>

Sets the monitoring port. All traffic from the port specified by `set-mon-port` is duplicated on *port*.

stop-mon

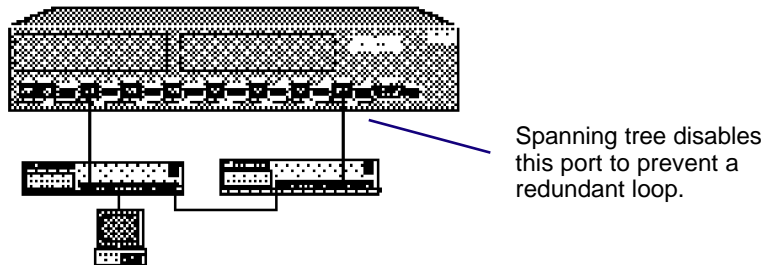
Stops port monitoring.

Spanning Tree Commands

Spanning tree automatically configures a loop-free topology in a bridged environment. The spanning tree agent is implemented in conformance with the IEEE 802.1d standard. In most cases, the defaults work fine and you won't need to change any parameters.

Example

Spanning tree is enabled anytime a packet could potentially be caught in an infinite loop on the network.



The protocol uses the port with the most efficient path and turns off the other port. In the example, each hub is connected to switch and to each other. Consequently, the workstation has two paths to the switch. In Ethernet, this isn't allowed and one of the switch ports must be turned off. Spanning tree sends out configuration messages and automatically determines which port is turned off. However, by changing spanning tree parameters, you can manually determine which port is turned off.

Spanning tree determines which port is turned off by selecting the port with the lowest cost path. This port is then called the root bridge (in this case, the root bridge is a switch port). Think of the lowest cost path as the quickest route from the workstation to the switch. In the case of a tie, the lowest numbered switch port is the root bridge. In the example, port 2 is root bridge and port 8 is turned off.

get-stp

```
get-stp
```

Displays the current state of spanning tree (either enabled or disabled). By default, spanning tree is enabled in accordance with 802.1d.

```
SYS_console> get-stp
Running Spanning Tree engine is enabled
Next session the Spanning Tree engine will be enabled
```

set-stp

```
set-stp {enable|disable}
```

Enables or disables the spanning tree protocol. Enabled is the default. Enabling or disabling spanning tree doesn't take effect until the SNMP agent is reset (*warm-reset*, *cold-reset*, or turning the power off and then on again).

get-st-bcfg

```
get-st-bcfg
```

Displays the spanning tree bridge parameters. If spanning tree is disabled, parameters aren't displayed.

```
SYS_console> get-st-bcfg
802.1D SPANNING TREE BRIDGE INFO
=====
Designated Root      : 8000-0020-1a00-0a5b
Bridge Priority      : 32768
Root Cost            : 0
Root Port           : 0
Max Age              : 20
Hello Time           : 2
Hold Time            : 1
Forward Delay        : 15
Bridge Max Age       : 20
Bridge Hello Time    : 2
Bridge Forward Delay : 15
```


get-st-pcfg

get-st-pcfg

Displays the spanning tree port parameter table. If spanning tree is disabled, parameters aren't displayed.

```
STP PORT TABLE
=====
```

ID	Prior	State	PathCost	DesigRoot	DesigCost	DesigBridge	DesigPort
1	128	fwd	10	8000-0020-1a00-0a5b	0	8000-0020-1a00-0a5b	8001
2	128	fwd	10	8000-0020-1a00-0a5b	0	8000-0020-1a00-0a5b	8002
3	128	fwd	10	8000-0020-1a00-0a5b	0	8000-0020-1a00-0a5b	8003
4	128	fwd	10	8000-0020-1a00-0a5b	0	8000-0020-1a00-0a5b	8004
5	128	fwd	10	8000-0020-1a00-0a5b	0	8000-0020-1a00-0a5b	8005
6	128	fwd	10	8000-0020-1a00-0a5b	0	8000-0020-1a00-0a5b	8006
7	128	fwd	10	8000-0020-1a00-0a5b	0	8000-0020-1a00-0a5b	8007
8	128	fwd	10	8000-0020-1a00-0a5b	0	8000-0020-1a00-0a5b	8008
9	128	dis	65535	8000-0020-1a00-0a5b	0	8000-0020-1a00-0a5b	8009
10	128	dis	65535	8000-0020-1a00-0a5b	0	8000-0020-1a00-0a5b	800a
11	128	dis	65535	8000-0020-1a00-0a5b	0	8000-0020-1a00-0a5b	800b
12	128	dis	65535	8000-0020-1a00-0a5b	0	8000-0020-1a00-0a5b	800c

get-st-syscfg

get-st-syscfg

Displays the spanning tree state for all ports.

```
SYS_console> get-st-syscfg

SYSTEM PORTS STATE
=====
```

PORT_ID	STATE	ST_RCV	ST_XMT	MG_RCV	MG_XMT	OP_RCV	OP_XMT	LRN_ENB
1	fwd	+	+	+	+	+	+	+
2	fwd	+	+	+	+	+	+	+
3	fwd	+	+	+	+	+	+	+
4	fwd	+	+	+	+	+	+	+
5	fwd	+	+	+	+	+	+	+
6	fwd	+	+	+	+	+	+	+
7	fwd	+	+	+	+	+	+	+
8	fwd	+	+	+	+	+	+	+
9	dis	-	-	-	-	-	-	-
10	dis	-	-	-	-	-	-	-
11	dis	-	-	-	-	-	-	-
12	dis	-	-	-	-	-	-	-

set-br-prio

```
set-br-prio <priority>
```

Sets the spanning tree bridge priority. Bridge priority forces a bridge to be selected as the root bridge, or as a designated bridge. The bridge priority is a value used in determining the identity of the root bridge. The bridge with the lowest value has the highest priority and will be selected as the root.

priority is a number from 0 to 65535. This is equivalent to setting the MIB variable dot1dStpPriority (RFC 1493).

set-br-maxage

```
set-br-maxage <maxage>
```

Sets the spanning tree bridge maximum age. Max age is the maximum time in seconds a bridge waits without receiving spanning tree configuration messages before attempting a reconfiguration. This parameter takes effect when a bridge is operating as the root bridge. Bridges not acting as the root use the root bridge's Max Age parameter.

maxage is in seconds, from 6 to 40. However, the corresponding MIB variable, dot1dStpBridgeMaxAge (RFC 1493), is in hundredths of seconds, ranging from 600 to 4000, and must be a multiple of 100.

set-br-hellot

```
set-br-hellot <hello_time>
```

Sets the spanning tree bridge hello time. Hello time is the interval between transmission of spanning tree configuration messages in seconds. All bridges send configuration messages during reconfiguration to select the designated root bridge (in this case, the switch port). Ports not acting as a root bridge use the root bridge hello-time value. After this is determined, only designated bridges (ports) send configuration messages.

hello_time is a number from 1 to 10 in seconds. However, the corresponding MIB variable, dot1dStpBridgeHelloTime (RFC 1493), is in hundredths of seconds ranging from 100 to 1000, and must be a multiple of 100.

set-br-fwdel

```
set-br-fwdel <forward_delay>
```

Sets the spanning tree bridge forward delay. Forward delay is the time interval in seconds spent waiting to change a port from its spanning tree preforwarding state to a forwarding state. This is necessary because every bridge on the network should ensure no loop is formed before allowing the port to forward packets.

forward_delay is in seconds, from 4 to 30. However, the corresponding MIB variable, dot1dStpBridgeForwardDelay (RFC 1493), is in hundredths of seconds from 400 to 3000, and must be a multiple of 100.

set-prt-prio

```
set-prt-prio <port_number> <port_priority>
```

Sets the spanning tree port priority. *port_number* is the decimal port number, and *port_priority* is a number from 1 to 255. This is equivalent to setting the MIB variable dot1dStpPortPriority (RFC 1493).

set-prt-enb

```
set-prt-enb <port_number> {enable|disable}
```

Enables or disables a port in the spanning tree. *port_number* is the decimal port number. This is equivalent to setting the MIB variable dot1dStpPortEnable (RFC 1493).

set-prt-pcost

```
set-prt-pcost <port_number> <path_cost>
```

Sets the spanning tree port path cost. *port_number* is the decimal port number, and *path_cost* is path cost from 1 to 65535. This is equivalent to setting the MIB variable dot1dStpPortPathCost (RFC 1493).

Port Configuration Commands

Use these commands to configure and display port settings.

get-port-cfg

Displays the current port configuration.

```
SYS_console> get-port-cfg
```

PORT_ID	LAN_TYPE	LINK	IF_TYPE	SPEED_SEL	LAN_SPEED	FDPLX	FCTRL
1	ETH10/100	OFF	TPFD	ASENSE	10Mbps	OFF	ON
2	ETH10/100	OFF	TPFD	ASENSE	10Mbps	OFF	ON
3	ETH10/100	OFF	TPFD	ASENSE	10Mbps	OFF	ON
4	ETH10/100	OFF	TPFD	ASENSE	10Mbps	OFF	ON
5	ETH10/100	ON	TPFD	ASENSE	10Mbps	OFF	ON
6	ETH10/100	OFF	TPFD	ASENSE	10Mbps	OFF	ON
7	ETH10/100	OFF	TPFD	ASENSE	10Mbps	OFF	ON
8	ETH10/100	OFF	TPFD	ASENSE	10Mbps	OFF	ON
9	NONE	----	PORT NOT	INSTALLED	----		
10	NONE	----	PORT NOT	INSTALLED	----		
11	NONE	----	PORT NOT	INSTALLED	----		
12	NONE	----	PORT NOT	INSTALLED	----		

The command displays the following information for each port:

- LAN type: ETH10/100 indicates the port can operate at 10 or 100 Mbps.
- Link status: ON or OFF.
- Physical interface type: TPFD indicates Twisted-pair (TP) Ethernet, Full Duplex (FD) capable.
- Speed select: ASENSE indicates the port auto-negotiates with the device on the other end.
- LAN Speed: LAN_SPEED indicates the speed of the link. By default, all ports are 10 Mbps when no device is attached.
- Full duplex mode: ON or OFF (default).
- Flow control: ON (default) or OFF. If you set a port to full duplex, flow control is automatically turned off (changes take effect after a reset). If you try to set flow control to ON while full duplex is selected, the Console Manager ignores the change on reset.

NOTE

Setting a port to full duplex automatically disables flow control. Since collisions don't happen on a full-duplex link, flow control isn't possible.

One exception is between two Express 10/100 switches. A special piece of information is added to packets traveling between switches to accomplish this.

set-port-dplex

```
set-port-dplex <port_number> {half|full}
```

Specifies whether the given port is in full-duplex or half-duplex (standard Ethernet) mode. The default is half-duplex. You must set the port speed to either 10 or 100 (*asense* is the default) before setting a port to full-duplex.

```
SYS_console> set-port-dplex 2 full
Port configured in <full_duplex> mode
Parameter change in NVRAM OK
```

set-speed-sel

```
set-speed-sel <port-number> {asense|10|100}
```

Sets a port's speed to 10, 100, or auto detect. The default is *asense*.

set-port-fctrl

```
set-port-fctrl <port-number> {on|off}
```

Turns the flow control feature on or off for the specified port. The default is on.

If the port is in full-duplex mode, flow control is turned off. Flow control or full duplex (or neither) can be active, but not both. One exception is between two Express 10/100 Switches.

```
SYS_console> set-port-fctrl 2 off
Port 2 - flow control <off>
Parameter change in NVRAM OK
```

Statistics Commands

This section contains instructions for displaying switching statistics using the Console Manager. The following commands provide full physical layer information as well as inter-port switching statistics. See Chapter 2 for definitions of individual statistics.

Under heavy traffic loading conditions, the Console Manager may understate the Ethernet statistical counts. You can also use a protocol analyzer to monitor the segment the port is attached to. See step 8 on page 72 for configuration details.

clr-cnt

Clears (resets) the Ethernet and bridging statistical counters.

get-eth-cnt

get-eth-cnt <port-number>

Displays the Ethernet Statistics Counters for port *port-number*. This is almost identical to the Ethernet-like Statistics Group of the Ethernet MIB.

```
SYS_console> get-eth-cnt 1
Ethernet Statistics for port 1
=====
Transmit   OK      : 2817886
Underflow  Errors:      0
Exces Coll Errors:      0
Exces Fctrl Errors:      0
Receive   EOF      : 2896502
Receive   OK      : 2896498
Overflow   Errors:      0
CRC        Errors:      0
Alignment  Errors:      0
Runt       Errors:      4
Lost/Fctrl Errors:      0
Too Long   Errors:      0
=====
```

get-colls-cnt

get-colls-cnt <port-number>

Displays the Ethernet collision statistics for each port. This is nearly identical to the Ethernet-like collisions statistics group of the Ethernet MIB and displays the collision count distribution for this port. If a packet still collides on the 16th count, the packet is dropped.

```
SYS_console> get-colls-cnt 1
Ethernet Collision Distribution for port 1
=====
0 collision count : 2819392
1 collision count :      10
2 collision count :      13
3 collision count :       4
4 collision count :       3
5 collision count :       2
6 collision count :       0
7 collision count :       2
8 collision count :       2
9 collision count :       0
10 collision count :       0
11 collision count :       0
12 collision count :       0
13 collision count :       0
14 collision count :       0
15 collision count :       0
16 collision count :       0
=====
```

NOTE

Collisions on the first few counts are normal. However, if collisions occur past the 10th count, you should reconfigure your network so devices that mostly talk to each other are on the same segment.

get-rmon-cnt

get-rmon-cnt <port>

Displays the remote monitoring (RMON) statistics group 1 counters for *port*.

```
SYS_console> get-rmon-cnt 1
Ethernet RMON Counters for port 1
=====
etherStatsOctets      : 942514513
etherStatsPkts       : 2900281
etherStatsBcastPkts  : 0
etherStatsMcastPkts  : 0
etherStatsCRCAlignPkts: 0
etherStatsUndersizePkts: 0
etherStatsOversizePkts : 0
etherStatsRuntPkts   : 4
etherStatsJabberPkts  : 0
etherStatsCollisions : 36
```

get-sdist-cnt

get-sdist-cnt <port>

Displays the RMON statistics packet size histogram for *port*.

```
SYS_console> get-sdist-cnt 1
RMON Packet Size Distribution Counters for port 1
=====
etherStatsPkts64Octets      : 678664
etherStatsPkts65to127Octets : 1634637
etherStatsPkts128to255Octets : 42062
etherStatsPkts256to511Octets : 27590
etherStatsPkts512to1023Octets : 49248
etherStatsPkts1024to1518Octets : 470762
```

get-br-cnt

get-br-cnt <port-number>

Displays the switching statistics counters for a port. The command displays the number of:

- frames or bytes received.
- frames forwarded.
- multicast frames.
- frames with unknown destination and subsequently multicast.
- frames transmitted.

- packets lost (if flow control is disabled) or number of packets retransmitted by the originator due to flow control (if flow control is enabled).
- packets or bytes forwarded to each port. For the port you specified, the number of packets or bytes represents filtered frames. Filtered frames are ones that don't need to be forwarded because they're destined for the same port they came in on.

```

SYS_console> get-br-cnt 1
Ethernet Switching Counters for port 1
=====
Frm  Received OK :   2905033
Bytes Received  : 943372029
Frm Filtered    :           0
Frm to all ports :           0
Frm multicast   :           0
Frm lost/fctrl  :           0
Transmit OK     :   2826591

Forward to port :      FRAMES      BYTES
-----
   1      :           0           0
   2      :           0           0
   3      :           0           0
   4      :           0           0
   5      :           0           0
   6      :           0           0
   7      :           0           0
   8      :   2905013   943375393
   9      :           0           0
  10      :           0           0
  11      :           0           0
  12      :           0           0
=====

```


get-mgm-brcnt

Displays the counters for the management interface. Management counters are continually updated even when no devices are attached to the switch (this is why the port Xmt LEDs always blink). This information is useful for seeing how much traffic the management interface is generating compared to the rest of the switch. This amount is usually insignificant.

```

SYS_console> get-mgm-brcnt
Management Port Counters
=====
Frm Received      :    15506
Bytes Received    :   1691744
Frm Filtered      :    15506
Frm Received Bcast:    15506
Frm Transmitted   :    93264
Frm Transmit Ucast:         0
Frm Transmit Mcast:   93264
Frm Transmit Bcast:         0
Received from port:      FRAMES          BYTES
-----
 1      :          0          0
 2      :          0          0
 3      :          0          0
 4      :          0          0
 5      :         165       17536
 6      :         326       39314
 7      :          0          0
 8      :        15015      1634894
 9      :          0          0
10      :          0          0
11      :          0          0
12      :          0          0
Transmit to port :      FRAMES          BYTES
-----
 1      :        11658       699480
 2      :        11658       699480
 3      :        11658       699480
 4      :        11658       699480
 5      :        11658       699480
 6      :        11658       699480
 7      :        11658       699480
 8      :        11658       699480
 9      :          0          0
10      :          0          0
11      :          0          0
12      :          0          0
-----

```

4

Troubleshooting

If you have problems with your Intel Express 10/100 Fast Ethernet Switch, use this chapter to help identify the problem and find a possible solution.

If you can't find information in this chapter about the problem you're having, get the following information:

- The serial number of the Express 10/100 Switch printed on the back side of the switch.
- The firmware revision number displayed by the Console Manager `sys-stat` message.
- The configuration of the equipment connected to the switch.
- The sequence of events leading up to your problem.
- Actions you have already taken.

If you call Intel Customer Support, you have 90 days of free support after your first call. Thereafter, Intel offers several Intel Support Service options. See the inside back cover for more information.

General Problems

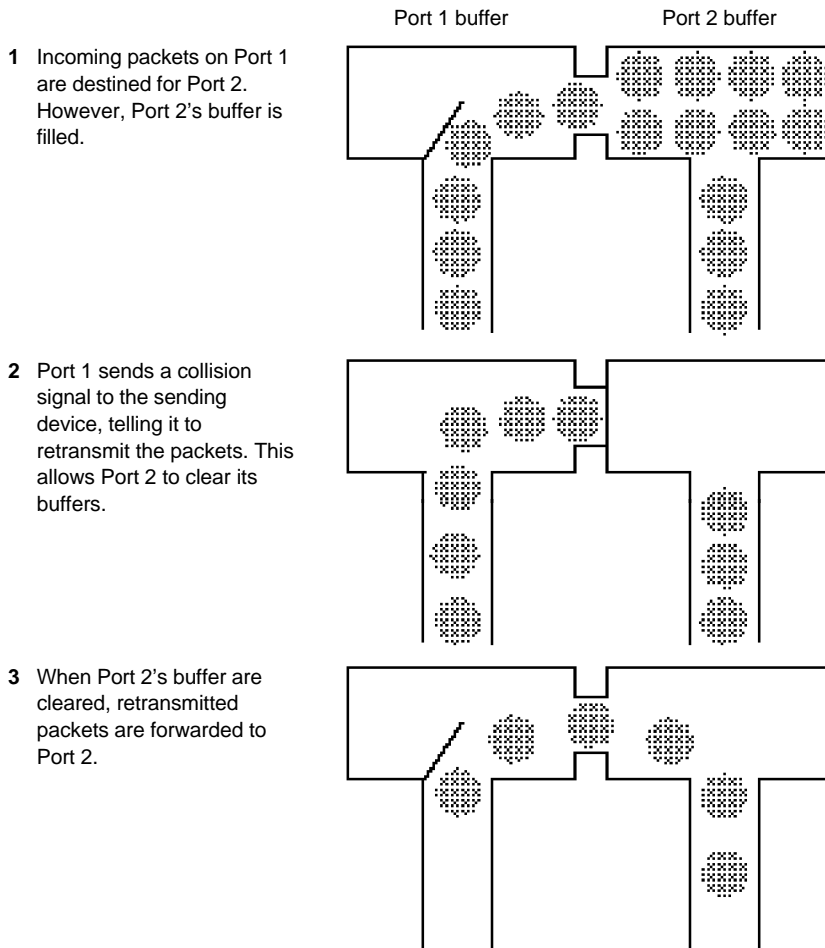
If you're having problems with the switch, follow the steps below:

- 1 Verify that your cables are wired correctly.** This is the most common problem. Use a UTP crossover cable to directly connect to a repeater or another switch. Use straight-through cables when connecting to servers or workstations. Try both the MDI and MDI-X connectors on port 1 if you're unsure of which cable to use. See page 8 for more information.
- 2 Make sure the unit is plugged into a functioning AC outlet.** Also, make sure the voltage setting next to the switch's power receptacle is set correctly. In the United States, Canada, and Japan the setting is 115. In most European and Asian countries, it's 230.
- 3 Review the switch's Link LEDs to ensure the ports you believe should be functioning are properly configured and not disabled.** Also, review the Link LEDs of other devices to ensure the ports that should be functioning are properly attached to the switch.
- 4 Make sure devices connected to the switch are operating at the same speed as the switch port.** Each switch port can be forced to either 10 or 100 Mbps (although auto-detect is the default). Also, other devices connected to the switch may be capable of operating at 10 or 100 Mbps. See page 66 for information on setting speed.
- 5 If you configured a port for full duplex, make sure the device on the other end is configured for full duplex and is capable of transmitting in full duplex.** Repeaters/hubs/concentrators can't operate in full duplex mode.
- 6 Make sure the equipment attached to the switch is properly configured.** If the Coll LED is on continuously (and you don't have full duplex configured), you may have an adapter problem.
- 7 Use the Console Manager to check the switch's status.** Use the `sys-stat` command to check overall system status and `get-port-cfg` to check the status of each port. To monitor traffic, use the switching statistics commands (see page 25).
- 8 You can also use a protocol analyzer to check monitor statistics.** If the port is configured in half-duplex mode, place a hub between the switch and the other device and attach the protocol analyzer to the hub. If the port is configured in full-duplex mode, place a tap between the device and switch and then attach a protocol analyzer to the tap. Contact your network services supplier for information on protocol analyzers and taps.

- 9 Restore the switch's defaults with the `init-nvram` command and then reset the switch with the `cold-reset` command.

Flow Control Problems

During times of peak network usage, you may occasionally see the Flow LED blink (for a description of the LED, see page 6). This is normal. However, if it stays lit for more than a few seconds at a time, or if the network management software reports an excessive number of flow controls, it might indicate a problem with your network configuration. Here's how flow control works:



A port's Flow LED flashes whenever a received packet needs to be forwarded to a port that already has too many packets queued. This indicates a temporary overload situation on one port; the total traffic to the port exceeds the amount its buffer can hold. This usually occurs when there are several fast devices on different ports trying to access a device across the switch (for example, 100 Mbps workstations accessing a 10 Mbps server). If this occurs rarely, don't do anything. However, if it occurs often, identify the devices causing flow control and move them to the same segment as the device they're talking to.

When Ethernet bandwidth is temporarily insufficient for the traffic, three actions are possible: drop packets, use flow control, or segment the network. Buffering packets only works for a very short while. An extended overload will eventually overflow buffers and cause dropped packets. Flow control stops transmission on a port and forces devices to resend packets, ensuring that packets aren't lost. This is the most reasonable solution, since it relies on Ethernet's inherent collision detection mechanism to relieve temporary overload.

Additionally, because it relies on collision detection, full duplex isn't possible when flow control is enabled. The exception is between two Express 10/100 switches. A special piece of information added to packets traveling between switches accomplishes this.



Technical Information

This chapter contains detailed information on default port and switch configuration options, product specifications, and supported standards for SNMP and MIB features.

Default Configuration

System

Internal software filename: flash12.hex

Database aging time: 300 seconds

SNMP: Read community: public
 Write community: private
 Authentication mode: enable
 Traps: none set

IP: BOOTP: disabled
 TTL: 255 (in range 1 to 255)

Ports 1-8

Type: 10BASE-T/100BASE-TX (auto detecting),
twisted-pair Ethernet (TPE)
Duplex mode: Half
Flow control: On

Ports 9-12

Not installed (see *Accessories* on next page)

Console Manager

Communications parameters: 9600 baud, 8-N-1
Login name: None
Password: None
Prompt: SYS_console>

Spanning tree

Spanning tree: Enabled
Bridge priority: 32768 0-65535
Bridge max. age: 20 6.0-40.0 sec.
Bridge hello time: 2 1.0-10.0 sec.
Bridge forward delay: 15 4.0-30.0 sec.
Port priority: 128 0-255
Path cost: 100 (1000/LAN speed in Mbps). If a port is
linked at 100 Mbps, the path cost is 10.

Specifications

Features

Buffer size: 64 Kbytes per port, 512 Kbytes total

Architecture: Store and forward for complete runt and error filtering on all packets. Flow control prevents packet loss.

MAC addresses supported: 4096 entries

Switching database: Transparent, automatic self-learning at full wire speed. Cache aging time manageable. Custom filtering by hardware address and port.

Accessories

Two-port 100BASE-TX expansion module (Intel order code ES101MATX)

Two-port 100BASE-FX expansion module (Intel order code ES101MAFX)

Redundant power supply (RPS) connector. RPS must be purchased separately.

LANDesk Network Manager (Intel order code EC100SNMP). Network Manager is a Windows-based SNMP network management system designed to manage Intel hubs and switches.

Network Management

In-band and out-of-band SNMP with MIB II, private MIB and out-of-band serial console support.

Status Indicators (per port)

Displays Link, Transmit, Receive, Full Duplex/Collision, Flow Control, Speed (10 or 100 Mbps).

General Indicators

Displays Management activity, SNMP presence, power supply status, device failure detection.

Boot and Configuration

NVRAM configuration loaded on power up and fully downloadable. Firmware local or remote downloadable. BOOTP supported.

Connector Interfaces

UTP/STP RJ-45 (MDI-X pin configuration; MDI or MDI-X for port 1)
RS232
SC fiber optic (on optional 100BASE-FX media adapter)

Maximum Cabling Distances

Switch to switch or switch to NIC:

Category 5 UTP: 328 feet (100 meters)

62.5/125 μ multimode fiber: 1.2 miles (2 kilometers) at full duplex
1351 feet (412 meters) at half duplex

Switch to repeater:

Category 5 UTP: 328 feet (100 meters)

62.5/125 μ multimode fiber: 525 feet (160 meters)

Standards Supported

10BASE-T

100BASE-TX, 100BASE-FX Fast Ethernet (IEEE 802.3u)

FDSE (Full Duplex Switched Ethernet)

Spanning Tree (IEEE 802.1d)

Internet Hosts (RFC1122/1123)

SMI (RFC1155)

SNMP (RFC 1157)

MIB (RFC1556)

MIB II (RFC 1213)

ENET MIB (RFC1398)

Bridge MIB (RFC1493)

RMON (RFC1757)

UDP/IP (RFC768/950/1071/791)

Mounting

Standard 19-inch rack, with mounting brackets

1-inch minimum clearance, sides and back

Electrical Specifications

AC line frequency: 47Hz-63Hz

Fuse: 100-120V/4A 200-240V/2A

Power Cord Specifications

115 volt configuration:

Minimum type SJT (SVT) 18/3, rated 250 Volts AC, 10 Amps with a maximum length of 15 feet. One end is terminated in an IEC 320 attachment plug, the other in a NEMA 5-15P plug.

230 volt configuration:

Minimum type SJT (SVT) 18/3, rated 250 Volts AC, 10 Amps with a maximum length of 15 feet. One end is terminated in an IEC 320 attachment plug. The other end is terminated as required by the country where it will be installed.

Electromagnetic Emissions and Safety Agency Approval

FCC Part 15, Subpart J, Class A

EN 55022 (CISPR22: 1985), Class A

VCCI Class 1 ITE

EN50082-1

UL listed (UL 1950) third edition

TUV certified to IEC 950 second edition plus A1/A2 and EN60950
A1/A2

CE Mark

CSA certified (CSA 22.2 #950)

Electrostatic discharge (ESD): IEC 801-2

Radiated Electromagnetic field: IEC 801-3

Electrical Fast Transient/burst: IEC 801-4

Environment

Operating temperature: 0 ~ 40° C (32 ~ 104° F)

Storage temperature: -10 ~ 65° C (14 ~ 149° F)

Humidity: < 85% (noncondensing)

ETL (UL-1950), TUV/VDE, CSA

SNMP and MIB Support

The Express 10/100 Switch contains a built-in SNMP agent running on the SNMP processor board. This allows each Express 10/100 Switch to be managed from a centralized management station via any SNMP-compliant NMS.

The SNMP agent software complies with the following standards:

- RFC 1155, The Structure of Management Information (SMI) for TCP/IP Based Internets, 5/90.
- RFC 1556, Management Information Base (MIB) for Network Managers of TCP/IP Based Internets, 5/90.
- RFC 1557, The Simple Network Management Protocol (SNMP), 5/90.
- RFC 1213, The Management Information Base II (MIB II), 3/91.
- RFC 1643, Definitions of Managed Objects for the Ethernet-like Interface Types.
- RFC 1573, Evolution of the Interfaces Group of MIB-II, 1/94.
- RFC 1493, Definitions of Managed Objects for Bridges, 7/93.
- RFC 793, Transmission Control Protocol.
- RFC 854, Telnet Protocol Specification.
- RFC 1055, Nonstandard for transmission of IP datagrams over serial lines: SLIP, 1/88.

The SNMP agent uses UDP/IP (RFC 768, RFC 950, RFC 1071 and RFC 791) as OSI layers 3 and 4 protocols, and ICMP (RFC 792) and ARP (RFC 826) to complete the UDP/IP protocol suite.

The UDP/IP stack implementation is conformant to:

- RFC 1122, Requirements for Internet hosts, communication layers.
- RFC 1123, Requirements for Internet hosts, application and support.

You can manage the Express 10/100 Switch with any SNMP Manager that conforms to the above standards.

The Express 10/100 Switch implements an Intel Enterprise MIB. Download SWCH2MIB.EXE from the Intel Customer Support World Wide Web site (<http://support.intel.com>) or Intel's FTP site (see inside back cover).

Limited Hardware Warranty

Intel warrants to the original owner that the hardware product delivered in this package will be free from defects in material and workmanship for one (1) year following the latter of: (i) the date of purchase only if you register by returning the registration card as indicated thereon with proof of purchase; or (ii) the date of manufacture; or (iii) the registration date if by electronic means provided such registration occurs within 30 days from purchase. This warranty does not cover the product if it is damaged in the process of being installed. Intel recommends that you have the company from whom you purchased this product install the product.

INTEL RESERVES THE RIGHT TO FILL YOUR ORDER WITH A PRODUCT CONTAINING NEW OR REMANUFACTURED COMPONENTS. THE ABOVE WARRANTY IS IN LIEU OF ANY OTHER WARRANTY, WHETHER EXPRESS, IMPLIED OR STATUTORY, INCLUDING, BUT NOT LIMITED TO, ANY WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR ANY WARRANTY ARISING OUT OF ANY PROPOSAL, SPECIFICATION OR SAMPLE.

This warranty does not cover replacement of products damaged by abuse, accident, misuse, neglect, alteration, repair, disaster, improper installation or improper testing. If the product is found to be otherwise defective, Intel, at its option, will replace or repair the product at no charge except as set forth below, provided that you deliver the product along with a return material authorization (RMA) number either to the company from whom you purchased it or to Intel (North America only). If you ship the product, you must assume the risk of damage or loss in transit. You must use the original container (or the equivalent) and pay the shipping charge. Intel may replace or repair the product with either new or remanufactured product or parts, and the returned product becomes Intel's property. Intel warrants the repaired or replaced product to be free from defects in material and workmanship for a period of the greater of: (i) ninety (90) days from the return shipping date; or (ii) the period of time remaining on the original one (1) year warranty.

This warranty gives you specific legal rights and you may have other rights which vary from state to state. All parts or components contained in this product are covered by Intel's limited warranty for this product; the product may contain fully tested, recycled parts, warranted as if new. For warranty information call one of the numbers below.

Returning a Defective Product (RMA)

Before returning any product, contact an Intel Customer Support Group and obtain an RMA number by calling:

North America only: 1-503-264-7000

Other locations: Return the product to the place of purchase for a refund or replacement.

If the Customer Support Group verifies that the product is defective, they will have the Return Material Authorization Department issue you an RMA number to place on the outer package of the product. Intel cannot accept any product without an RMA number on the package.

LIMITATION OF LIABILITY AND REMEDIES

INTEL SHALL HAVE NO LIABILITY FOR ANY INDIRECT OR SPECULATIVE DAMAGES (INCLUDING, WITHOUT LIMITING THE FOREGOING, CONSEQUENTIAL, INCIDENTAL AND SPECIAL DAMAGES) ARISING FROM THE USE OF OR INABILITY TO USE THIS PRODUCT, WHETHER ARISING OUT OF CONTRACT, NEGLIGENCE, TORT, OR UNDER ANY WARRANTY, IRRESPECTIVE OF WHETHER INTEL HAS ADVANCE NOTICE OF THE POSSIBILITY OF ANY SUCH DAMAGES, INCLUDING, BUT NOT LIMITED TO LOSS OF USE, BUSINESS INTERRUPTIONS, AND LOSS OF PROFITS, NOTWITHSTANDING THE FOREGOING, INTEL'S TOTAL LIABILITY FOR ALL CLAIMS UNDER THIS AGREEMENT SHALL NOT EXCEED THE PRICE PAID FOR THE PRODUCT. THESE LIMITATIONS ON POTENTIAL LIABILITIES WERE AN ESSENTIAL ELEMENT IN SETTING THE PRODUCT PRICE. INTEL NEITHER ASSUMES NOR AUTHORIZES ANYONE TO ASSUME FOR IT ANY OTHER LIABILITIES.

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you.

Software provided with the hardware product is not covered under the hardware warranty described above. See the applicable software license agreement which shipped with the hardware product for details on any software warranty.

Limited Hardware Warranty (Europe only)

Intel Corporation (UK) Ltd for customers within the UK and Intel International Ltd (Intel Corporation (UK) Ltd and Intel International Ltd hereinafter referred to collectively as “Intel”) for customers within Europe outside of the UK warrants to the original owner that the hardware product delivered in this package will be free from defects in material and workmanship for one (1) year following the latter of: (i) the date of purchase only if you register by returning the registration card as indicated thereon with proof of purchase; or (ii) the date of manufacture; or (iii) the registration date if by electronic means provided such registration occurs within 30 days from purchase. This warranty does not cover the product if it is damaged in the process of being installed. Intel recommends that you have the company from whom you purchased this product install the product.

INTEL RESERVES THE RIGHT TO FILL YOUR ORDER WITH A PRODUCT CONTAINING NEW OR REMANUFACTURED COMPONENTS. THE ABOVE WARRANTY IS IN LIEU OF ANY OTHER WARRANTY, WHETHER EXPRESS, IMPLIED OR STATUTORY, INCLUDING, BUT NOT LIMITED TO, ANY WARRANTY OF SATISFACTORY QUALITY, FITNESS FOR A PARTICULAR PURPOSE, OR ANY WARRANTY ARISING OUT OF ANY PROPOSAL, SPECIFICATION OR SAMPLE.

This warranty does not cover replacement of products damaged by abuse, accident, misuse, neglect, alteration, repair, disaster, improper installation or improper testing. If the product is found to be otherwise defective, Intel, at its option, will replace or repair the product at no charge except as set forth below, provided that you deliver the product along with a return material authorization (RMA) number either to the company from whom you purchased it or to Intel. If you ship the product, you must assume the risk of damage or loss in transit. You must use the original container (or the equivalent) and pay the shipping charge. Intel may replace or repair the product with either new or remanufactured product or parts, and the returned product becomes Intel’s property. Intel warrants the repaired or replaced product to be free from defects in material and workmanship for a period of the greater of: (i) ninety (90) days from the return shipping date; or (ii) the period of time remaining on the original one (1) year warranty.

This warranty gives you specific legal rights and you may have other rights which vary from state to state. All parts or components contained in this product are covered by Intel’s limited warranty for this product; the product may contain fully tested, recycled parts, warranted as if new.

Returning a Defective Product (RMA)

Before returning any product, contact an Intel Customer Support Group and obtain an RMA number by calling one of the following numbers for the applicable language in which you require support:

France	+44 1793 404988
Germany	+44 1793 404777
Italy	+44 1793 404141
United Kingdom	(+44) (0)1793 404900

If the Customer Support Group verifies that the product is defective, they will have the Return Material Authorization Department issue you an RMA number to place on the outer package of the product. Intel cannot accept any product without an RMA number on the package.

LIMITATION OF LIABILITY AND REMEDIES

INTEL SHALL HAVE NO LIABILITY FOR ANY INDIRECT OR SPECULATIVE DAMAGES (INCLUDING, WITHOUT LIMITING THE FOREGOING, CONSEQUENTIAL, INCIDENTAL AND SPECIAL DAMAGES) ARISING FROM THE USE OF OR INABILITY TO USE THIS PRODUCT, WHETHER ARISING OUT OF CONTRACT, NEGLIGENCE, TORT, OR UNDER ANY WARRANTY, IRRESPECTIVE OF WHETHER INTEL HAS ADVANCE NOTICE OF THE POSSIBILITY OF ANY SUCH DAMAGES, INCLUDING, BUT NOT LIMITED TO LOSS OF USE, BUSINESS INTERRUPTIONS, AND LOSS OF PROFITS, NOTWITHSTANDING THE FOREGOING, INTEL’S TOTAL LIABILITY FOR ALL CLAIMS UNDER THIS AGREEMENT SHALL NOT EXCEED THE PRICE PAID FOR THE PRODUCT. THESE LIMITATIONS ON POTENTIAL LIABILITIES WERE AN ESSENTIAL ELEMENT IN SETTING THE PRODUCT PRICE. INTEL NEITHER ASSUMES NOR AUTHORIZES ANYONE TO ASSUME FOR IT ANY OTHER LIABILITIES.

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you.

Appendix A Technical Information

Software provided with the hardware product is not covered under the hardware warranty described above. See the applicable software license agreement which shipped with the hardware product for details on any software warranty.

This Agreement shall be governed by the laws of England and the courts of England shall have exclusive jurisdiction of any dispute arising hereunder.

Federal Communications Commission (FCC) Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

The user is cautioned that changes and modifications made to the equipment without approval of the manufacturer could void the user's authority to operate this equipment.

Manufacturer Declaration

This certifies that the Intel Express 10/100 Fast Ethernet Switch complies with the EU Directive 89/33/EEC, using the EMC standards EN55022 (Class A) and EN50082-1. This product also meets or exceeds EN 60950 (TUV) requirements. This product has been tested and verified to meet CISPR 22 Class A requirements.

WARNING

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

WARNING

The system is designed to operate in a typical office environment. Choose a site that is:

- Clean and free of airborne particles (other than normal room dust).
- Well ventilated and away from sources of heat including direct sunlight.
- Away from sources of vibration or physical shock.
- Isolated from strong electromagnetic fields produced by electrical devices.
- In regions that are susceptible to electrical storms, we recommend you plug your system into a surge suppressor and disconnect telecommunication lines to your modem during an electrical storm.
- Provided with a properly grounded wall outlet.

Do not attempt to modify or use the supplied AC power cord if it is not the exact type required.

Ensure that the system is disconnected from its power source and from all telecommunications links, networks, or modems lines whenever the chassis cover is to be removed. Do not operate the system with the cover removed.

AVERTISSEMENT

Le système a été conçu pour fonctionner dans un cadre de travail normal. L'emplacement choisi doit être:

- Propre et dépourvu de poussière en suspension (sauf la poussière normale).
- Bien aéré et loin des sources de chaleur, y compris du soleil direct.
- A l'abri des chocs et des sources de vibrations.
- Isolé de forts champs magnétiques générés par des appareils électriques.
- Dans les régions sujettes aux orages magnétiques il est recommandé de brancher votre système à un supresseur de surtension, et de débrancher toutes les lignes de télécommunications de votre modem durant un orage.
- Muni d'une prise murale correctement mise à la terre.

Ne pas utiliser ni modifier le câble d'alimentation C. A. fourni, s'il ne correspond pas exactement au type requis.

Assurez vous que le système soit débranché de son alimentation ainsi que de toutes les liaisons de télécommunication, des réseaux, et des lignes de modem avant d'enlever le capot. Ne pas utiliser le système quand le capot est enlevé.

WARNUNG

Das System wurde für den Betrieb in einer normalen Büroumgebung entwickelt. Der Standort sollte:

- sauber und staubfrei sein (Hausstaub ausgenommen);
- gut gelüftet und keinen Heizquellen ausgesetzt sein (einschließlich direkter Sonneneinstrahlung);
- keinen Erschütterungen ausgesetzt sein;
- keine starken, von elektrischen Geräten erzeugten elektromagnetischen Felder aufweisen;
- in Regionen, in denen elektrische Stürme auftreten, mit einem Überspannungsschutzgerät verbunden sein; während eines elektrischen Sturms sollte keine Verbindung der Telekommunikationsleitungen mit dem Modem bestehen;
- mit einer geerdeten Wechselstromsteckdose ausgerüstet sein.

Versuchen Sie nicht, das mitgelieferte Netzkabel zu ändern oder zu verwenden, wenn es sich nicht um genau den erforderlichen Typ handelt.

Das System darf weder an eine Stromquelle angeschlossen sein noch eine Verbindung mit einer Telekommunikationseinrichtung, einem Netzwerk oder einer Modem-Leitung haben, wenn die Gehäuseabdeckung entfernt wird. Nehmen Sie das System nicht ohne die Abdeckung in Betrieb.

AVVERTENZA

Il sistema è progettato per funzionare in un ambiente di lavoro tipico. Scegliere una postazione che sia:

- Pulita e libera da particelle in sospensione (a parte la normale polvere presente nell'ambiente).
- Ben ventilata e lontana da fonti di calore, compresa la luce solare diretta.
- Al riparo da urti e lontana da fonti di vibrazione.
- Isolata dai forti campi magnetici prodotti da dispositivi elettrici.
- In aree soggette a temporali, è consigliabile collegare il sistema ad un limitatore di corrente. In caso di temporali, scollegare le linee di comunicazione dal modem.
- Dotata di una presa a muro correttamente installata.

Non modificare o utilizzare il cavo di alimentazione in c. a. fornito dal produttore, se non corrisponde esattamente al tipo richiesto.

Prima di rimuovere il coperchio del telaio, assicurarsi che il sistema sia scollegato dall'alimentazione, da tutti i collegamenti di comunicazione, reti o linee di modem. Non avviare il sistema senza aver prima messo a posto il coperchio.

ADVERTENCIAS

El sistema está diseñado para funcionar en un entorno de trabajo normal. Escoja un lugar:

- Limpio y libre de partículas en suspensión (salvo el polvo normal)
- Bien ventilado y alejado de fuentes de calor, incluida la luz solar directa.
- Alejado de fuentes de vibración.
- Aislado de campos electromagnéticos fuertes producidos por dispositivos eléctricos.
- En regiones con frecuentes tormentas eléctricas, se recomienda conectar su sistema a un eliminador de sobrevoltage y desconectar el módem de las líneas de telecomunicación durante las tormentas.
- Previsto de una toma de tierra correctamente instalada.

No intente modificar ni usar el cable de alimentación de corriente alterna, si no se corresponde exactamente con el tipo requerido.

Asegúrese de que cada vez que se quite la cubierta del chasis, el sistema haya sido desconectado de la red de alimentación y de todos los enlaces de telecomunicaciones, de red y de líneas de módem. No ponga en funcionamiento el sistema mientras la cubierta esté quitada.

I

Index

100 LED, 6
100BASE-FX cabling requirements, 7
100BASE-TX cabling requirements, 7

A–C

Access restrictions
 creating virtual LANs (VLANs), 23
add-arp-entry command, 47
add-cf-entry command, 55
add-lt-entry command, 53
add-trap command, 50
Address table *See* Switching database
 commands
Addresses
 up to 4096 entries, 77
banner command, 38
BOOTP
 displaying current state, 44
 enabling or disabling, 44
Bridge *See* Spanning tree
Broadcast address
 setting, 44

Cabling
 crossover cables, 4
 fiber optic, 7
 maximum distances, 78
 null-modem cable, using, 6
 requirements, 4, 7
 straight-through, 8
 UTP (twisted-pair) requirements, 7
clear command, 38
clr-cnt command, 66
cold-reset command, 40
Collision
 Coll/Fdpx LED, 6
COM port settings for Console Manager, 16
Command history, 18
Communication parameters, 16
Configuration
 broadcast address, 44
 default gateway, 44
 defaults, 75–76
 full duplex, 22
 IP address, 44
 Mixed 10/100 Mbps workgroups, 10
 netmask, 44

- Configuration (continued)
 - network topology, 10
 - ports, 65
 - samples, 10
 - SNMP, 21
 - subnet mask, 44
 - switch, 15–29, 31–70
 - Wide Area Networks (WANs), 12
- Configuring and Managing the Switch, 15–29, 31–70
- Connectivity, checking *See* Ping commands
- Console Manager
 - accessing locally, 16
 - accessing remotely, 16
 - assigning an IP address, 21
 - command groups, 19
 - default settings, 76
 - displaying command history, 18
 - displaying help, 18
 - entering commands, 17
 - keyboard shortcuts, 18
 - terminal settings, 16
- Controlling the switching database, 51
- Crossover cables, 4
- Custom filters
 - other commands, 54

D–F

- Database, switching
 - control commands, 51
- Default gateway address, 44
- Default settings
 - listed, 75
 - resetting, 41
- `del-arp-entry` command, 47
- `del-cf-entry` command, 56
- `del-lt-addr` command, 53
- `del-lt-entry` command, 53
- `del-sec-vlan` command, 58
- `del-trap` command, 50
- `del-vbc-domain` command, 58

- Diagnostics, viewing the last failure, 40
- Distance limitations
 - fiber optic, 7
 - UTP, 7
- Electrical specifications, 79
- Environmental limits, 79
- Error LED, *see* fault
- Errors, displaying the last error, 40
- Ethernet address, displaying switch's, 39
- Fast Ethernet, connecting devices, 4
- Fault LED, 6
- Fiber optic cabling, 7
 - sample configuration, 12
- `find-lt-addr` command, 53
- Flow (Flow Control) LED, 5
- Frame generator
 - specifying parameters, 42
 - starting, 43
 - stopping, 43
- Full duplex
 - configuring a port for, 22
 - requirements, 22

G

- Gateway address, displaying, 45
- `get-arp-tbl` command, 47
- `get-auth` command, 49
- `get-bootp` command, 44
- `get-br-cnt` command, 68
- `get-colls-cnt` command, 67
- `get-comm` command, 48
- `get-con-matrix` command, 57
- `get-def-ttl` command, 45
- `get-eth-cnt` command, 67
- `get-gatew` command, 45
- `get-ip` command, 43
- `get-ip-conf` command, 43
- `get-last-err` command, 40
- `get-lt-16` command, 52
- `get-lt-age` command, 54
- `get-lt-entry` command, 51
- `get-lt-filter` command, 55

get-mgm-brcnt command, 70
 get-nv-cfilt command, 56
 get-nv-cftbl command, 56
 get-port-cfg command, 22, 65
 get-rmon-cnt command, 68
 get-rsw-file command, 41
 get-sdist-cnt command, 68
 get-slip command, 44
 get-slip-conf command, 45
 get-st-bcfg command, 61
 get-st-pcfg command, 62
 get-st-syscfg command, 62
 get-stp command, 61
 get-stst-level command, 40
 get-svlan-tbl command, 59
 get-sw-file command, 41
 get-tftp-srvr command, 42
 get-traps command, 49
 get-vbc-matrix command, 57
 get-vbc-tbl command, 58

H-K

Hardware address *See* MAC address:
 displaying
 Hardware installation
 rack mount, 4
 shelf mount, 4
 Hardware installation and network topology,
 3-14
 help-kbd command, 38
 Humidity limits, 79
 init-nvram command, 41
 Installation
 hardware, 3
 rack mount, 4
 Installing
 detailed instructions, 4
 Quick Start, 1, 2

IP address
 associating with a MAC address, 47
 displaying, 43
 for SNMP, 2, 21
 setting, 44
 IP commands, 43
 IP configuration for SNMP, 44
 IP gateway, 45
 IP networks, accessing different networks, 45
 Keyboard shortcuts
 display previous command, 18
 erase entire line, 18
 erase previous word, 18

L

Learn table *See* Switching database commands
 LEDs
 100, 6
 Fault, 6
 Flow (Flow Control), 5
 Link, 6
 management status, 6
 Mgmt (Management), system, 6
 port status, 5
 Pwr (Power), 6
 Rcv (Receive), 5
 SNMP, 6
 Xmt (transmit), 5
 Lights *See* LEDs
 Link LED, 6
 login command, 38
 Login prompt, 2
 logout command, 38

M–O

- MAC address
 - associating with an IP address, 47
 - displaying, 39
- Management, accessing, 16
- Mgmt (Management) LED, 6
- MIB
 - getting file for NMS, 21
 - getting support for NMS, 2
 - support, 80
- monitor command, 59
- Monitoring ports with protocol analyzer, 59
- Multi-mode fiber cabling, 7
- Netmask
 - setting, 44
 - SNMP agent for IP, 2, 21
- Network management
 - through SNMP, 2, 21
 - with Console Manager, 16
- Network topology and samples, 10
- Node address, displaying, 39
- Null-modem cable, 6
- NVRAM save settings, 41
- Out-of-band management
 - remote access, 16
 - setting to SLIP mode, 41
- Overview, hardware, 3

P–R

- Password, setting and changing, 2, 16, 39
- ping command, 46
- Ping commands, 46
- ping-stop command, 46
- Port configuration
 - default, 76
 - displaying, 65
 - full duplex, 22
 - status, 39
- Power (Pwr) LED, 6
- Prompt, changing, 38
- Protocol analyzer, attaching, 59

- Quick Start, 1, 2
- Rack mount installation, 4
- Rcv (Receive) LED, 5
- Remote access, 16
- Repeaters
 - cabling for, 9
 - count limitations, 14
- Resetting counters, 66
- Resetting the switch
 - cold-reset command, 40
 - warm-reset command, 40
- Restoring defaults, 41
- Restricting access
 - creating virtual LANs, 23
- RFC standards supported, 80
- Routers, specifying for SNMP management, 45

S

- Sample topologies, 10
- Security
 - creating virtual LANs, 23
 - set-passwd command, 39
- Segment
 - each port is one segment, 4
 - recommendations, 4
- set-auth command, 49
- set-bootp command, 44
- set-br-fwdel command, 64
- set-br-hellot command, 63
- set-br-maxage command, 63
- set-br-prio command, 63
- set-comm command, 48
- set-def-ttl command, 45
- set-fg-param command, 42
- set-gatew command, 45
- set-ip command, 44
- set-ip-conf command, 44
- set-line-slip command, 41
- set-lt-age command, 54
- set-par-file command, 42
- set-passwd command, 39
- set-port-dplex command, 22, 66

- set-port-fctrl command, 66
- set-prompt command, 38
- set-prt-enb command, 64
- set-prt-pcost command, 64
- set-prt-prio command, 64
- set-rsw-file command, 42
- set-sec-vlan command, 58
- set-slip command, 45
- set-slip-conf command, 45
- set-speed-sel command, 66
- set-stp command, 61
- set-stst-level command, 40
- set-sw-file command, 41
- set-vbc-domain command, 58
- SLIP connection
 - displaying address, 44
 - displaying configuration, 45
 - setting address, 45
 - setting configuration, 45
 - setting mode, 41
- SNMP
 - configuring agent, 21
 - displaying software version, 39
 - displaying IP address, 44
 - displaying object ID, 39
 - LED, 6
 - specifying BOOTP parameter file, 42
 - support, 80
- Spanning tree
 - default settings, 76
 - other commands, 60
- Specifications
 - addresses, 77
 - boot and configuration, 78
 - buffers, 77
 - electrical, 79
 - environment, 79
 - general indicators, 78
 - interfaces, 78
 - mounting, 78
 - network management, 77
 - power cord, 79
 - standards supported, 78
 - Specifications (continued)
 - status indicators, 77
 - switching database, 77
 - Speed, setting for a port, 66
 - Standards supported, 78, 80
 - start-fg command, 43
 - stop-fg command, 43
 - stop-mon command, 59
 - Straight-through cables, 8
 - Subnet mask *See netmask*
 - sw-dnld command, 42
 - Switching database commands, 50
 - Switch
 - Quick Start, 1, 2
 - using, 5
 - sys-stat command, 39

T-X

- Technical specifications, 75
- Telnet, 16
- Temperature limits, 79
- Terminal emulation settings, 16
- TFTP server IP address
 - displaying, 42
 - setting, 42
- TFTP to update EEPROM, 41
- Topology, network, 10
- Transmit (XMT) LED, 5
- TTL (Time to Live)
 - displaying, 45
 - setting, 45
- Twisted-pair (TPE) cabling, 7
- Using the Console Manager, 17–19
- Virtual Broadcast Domains (VBDs)
 - creating, 23, 56
- Virtual LANs (VLANs)
 - creating, 23
 - other commands, 56
- warm-reset command, 40
- Xmt (Transmit) LED, 5

Intel Automated Customer Support

You can reach Intel's automated support services 24 hours a day, every day at no charge. The services contain the most up-to-date information about Intel products. You can access installation instructions, troubleshooting information, and general product information.

	World Wide Web & Internet FTP Access Intel's World Wide Web home page or download information using anonymous FTP.	Intel BBS Use Intel's Bulletin Board. Dial in by modem at 8-N-1, and up to 14.4 Kbps.
Troubleshooting	✓	
Software updates	✓	✓
Installation notes	✓	
Product information	✓	
How to access:	WWW <i>News:</i> news://cs.intel.com <i>Customer Support:</i> http://support.intel.com FTP <i>Host:</i> ftp.intel.com <i>Directory:</i> pub/support/enduser_reseller	US and Canada 1-503-264-7999 Europe +44-1793-432955 Worldwide +1-503-264-7999

Intel Customer Support Technicians

Free support for 90 days: You can speak with our technical support professionals free of charge for 90 days after your initial call.

Other support services: You can purchase a range of support services, including 24 hour support, per incident support, on-site service, and software and hardware maintenance agreements. For details about the Intel Support Service options, download document 8549 from one of the automated services.

Worldwide access: Intel has technical support centers worldwide. Many of the centers are staffed by technicians who speak the local languages. For a list of all Intel support centers, the telephone numbers, and the times they are open, download document 9089 from one of the automated services.

If you don't have access to automated services, contact your local dealer or distributor.
 Or call +1-503-264-7000 from 07:00 to 17:00 Monday through Friday, U.S. Pacific Time